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WOLLENWEBER (H. W.) & RICHTER (H.). **Die Douglasienschütte und ihr Erreger, Rhabdocline pseudotsugae Syd.** [The leaf fall of Douglas Firs and its agent, *Rhabdocline pseudotsugae* Syd.]—*Blumen- und Pflanzenbau*, xlvii, 11, pp. 167–168, 1 fig., 1932.

This is a condensed version of the writers' paper on the leaf fall of Douglas firs (*Pseudotsuga taxifolia*) caused by *Rhabdocline pseudotsugae* in Germany, a notice of which has already appeared [*R.A.M.*, xii, p. 66].

VANINE (S. I.). Материалы по изучению окраски древесины, вызываемой грибами и химическими причинами. [Contribution to the study of discoloration in timber caused by fungi or chemical agents.]—*Bull. Leningrad Inst. for Controlling Farm and Forest Pests*, 3, pp. 3–37, 11 figs., 1932. [English summary.]

After a brief reference to the economic importance of the various discolorations which occur in felled timber (blue stain [*R.A.M.*, xi, p. 616] alone being responsible for some 1,500,000 roubles' [nominally £150,000] annual losses to the Soviet timber export industry), the author gives short Russian diagnoses of 70 species of fungi belonging to several families which cause such discolorations without affecting the technical qualities of the wood, and which are subdivided by the colour of the stain caused by them. This is followed by an annotated list of six wood-rotting Basidiomycetes which cause different discolorations in the initial stages of their development, and which are also grouped by the colour of the stain produced. A few notes are also given on the discolorations of wood caused by certain chemical agents, among which an interesting case is cited, in which pine boards were superficially stained yellow by the fumes emanating from aniline spilt in the hold of the steamer transporting the boards; the discoloration was removed by treating the boards with ammonia.

MILLER (V. V.). Вопросы биологии и диагностики домовых грибов. I. Процесс гниения древесины как источник ее самоувлажнения. II. О диагностике домовых грибов в бесплодном состоянии. [Points in the biology and diagnosis of house fungi. I. The rotting process as a source of self-wetting

for timber. II. Diagnosis of house fungi in their sterile stage.]—Pamphlet issued by *State Forestal Technical Publishing Office*, Leningrad, 40 pp., 1932.

In the first part of this paper the author describes at length controlled experiments with *Merulius lacrymans*, *Poria vaporaria*, and *Coniophora cerebella*, the results of which showed that the amount of free water formed by them in breaking down wood cellulose varied but little, and well within the limits of experimental error, from the theoretical amount (55·55 per cent. of the dry weight of cellulose) calculated from the equation

$$\frac{C_6H_{10}O_5}{162} + \frac{6O_2}{192} = \frac{5H_2O}{90} + \frac{6CO_2}{264}$$

which represents the degradation of cellulose to water and carbon dioxide by the fungi. The importance of the water thus produced as a source of moisture, independent of external supply, in timber rotted by these organisms, or for that matter, by any other cellulose-decomposing fungus, is well illustrated by the fact that it was calculated to amount to 139 l. per 1 c.m. of pine wood rotted to a loss of 50 per cent. of its initial air-dry weight, the specific gravity of the wood being 0·5. To this must also be added the water resulting from the decomposition of pentosans ($C_5H_8O_{10}$), which was computed to amount to 54·54 per cent. of the dry weight of these substances. Further theoretical calculations (confirmed in part experimentally) indicated that, in the absence of evaporation, the intrinsic humidity of the wood should increase as the dry weight is reduced by rotting, but at a considerably higher rate, and that the accumulation of water should occur the more rapidly the higher is the initial moisture content of the wood. Thus, if for an initial water content of 20 per cent. the humidity is increased 21 times for a loss of 55 to 60 per cent. of the dry weight, in timber with 80 per cent. initial moisture, the humidity should be 37·66 times the initial one at the same stage of decay. Experimentally it was established that in flasks, in which an air current was maintained at known rates of flow, the accumulation of water is a function of three main factors, namely, the initial moisture content of the wood, the rapidity of flow of the air, and the rotting energy of the given fungus (calculated in percentages of the dry weight of the wood decomposed per 24 hours). The increase in humidity was checked both by higher air velocities, and when the rotting energy of the fungus sank below a certain minimum. The rotting energy of *M. lacrymans* was found to be correlated with a complex set of environmental conditions, among which the water content of the substratum is an important factor. In flasks in which the wood contained an excess of moisture, the fungus developed inside the substratum very slowly, but produced a very luxuriant aerial mycelium which gave an abundant exudation of water in droplets, with the result that, instead of increasing, the humidity of the substratum was actually found to have been slightly reduced at the end of 63 days. This case leads the author to conceive the possibility that in *M. lacrymans* the function of the aerial mycelium may be twofold, namely, to exhaust excessive humidity from a very moist substratum and thus facili-

tate the progress of the internal mycelium, and, on the other hand, to pave the way for the further progress in space of the fungus by increasing the humidity of the ambient air and by depositing sufficient moisture on the surface of air-dry new wood with which it comes in contact, thus allowing the fungus to get a first foothold on it (the latter was actually proved experimentally). Once established, the fungus becomes independent of any external supply of water, as it can thrive on the water that results from its rotting activity, the more so that it was shown to be much less exigent in its water requirements than the other two fungi. This hypothesis offers a ready explanation for the wetness of the wood rots caused by *M. lacrymans*, as compared to those caused by the other fungi, and also of the fact that it is known to be capable of spreading to a considerable distance in wooden structures, even in the absence of all visible sources of water, without invoking, as previous investigators have done, any water-conducting capacity of its strands. The practical application of the results of the investigation to questions of prevention and control of timber rots, with particular reference to constructional wood, is discussed at some length.

In the second part, the author describes a method for the rapid identification of the sterile mycelia of wood-rotting fungi, based on the fact that the cell walls of both dead and living main, thick-walled hyphae, poor in protoplasm, of *M. lacrymans* and *M. silvester*, are stained metachromatically by certain vital stains, such as neutral red, methylene blue, and toluidin blue, the last-named of which gives the most striking effect, visible even with the naked eye, the cell walls acquiring a rich violet colour. Living protoplasm does not take the stain, but the contents of dead thin-walled hyphae acquire the fundamental colour of the stain, the thin walls remaining practically unstained. In *P. vaporaria* and all the other species of *Poria* which were tested, the cell walls do not take the stain, while the protoplasm is stained the fundamental colour of the stain. In *C. cerebella* the walls of living cells are hardly stained, while those of dead cells take a faint bluish-violet tinge, and the dead protoplasm a dark violet colour. This method, which is claimed to have been successfully used in the author's laboratory for over a year, also gave indications of being useful in the rapid identification of other sterile mycelia, as shown by a few preliminary results which are very briefly discussed. In some cases, members of the same taxonomic genus behaved differently in their reactions to the stain, possibly indicating an incorrect systematic grouping.

Vanine (S. I.) & Vladimirskaya (Mme N. N.). **К биологии домовых грибов.** [Contribution to the biology of house fungi.] —*Bull. Leningrad Inst. for Controlling Farm and Forest Pests*, 3, pp. 57–74, 4 figs., 1932. [English summary.]

The investigation reported in some detail in this paper was made to throw light on some obscure points in the biology of *Merulius lacrymans* and *Coniophora cerebella*. In mixed cultures of the two fungi on agar, at first the two organisms developed normally, without exerting any visible effect on each other, but when contact between the colonies was reached, *M. lacrymans* had

a depressing effect on the growth of *C. cerebella* (as shown by the latter's mycelium assuming abnormal forms), and finally overgrew it. In wood [species not stated] artificially inoculated with a mixture of the two fungi, the rot produced was very slightly greater (well within the limits of experimental error) than that caused by either fungus singly. *M. lacrymans* was shown not to be able to live in air rarefied to a pressure of 17 mm. mercury; its mycelium lost its viability after 19 days in such an atmosphere, while in air rarefied to 33 mm. its rate of growth was slowed down to half of that in normal air. On the other hand, the growth of *C. cerebella* was not retarded at this rarefaction, and its viability was not affected by 19 days' sojourn in air rarefied to 17 mm. The mycelium of *M. lacrymans* was killed by an exposure of one hour to a temperature of 40° C. or by 20 minutes at 60°, while *C. cerebella* withstood both tests and was only killed at temperatures over 60°. Three hours' exposure to a temperature of − 20° killed *M. lacrymans*, while *C. cerebella* remained viable after the same length of exposure to − 30°.

The embedding in concrete of wood infected with either or both of the fungi did not check the development of the rot. The mycelium of *M. lacrymans* was able to penetrate through the pores in the concrete to a depth of 1 cm., indicating that to protect timber from outside contamination the layer of concrete covering it should be over 1 cm. thick.

VANINE (S. I.) & VLADIMIRSKAYA (Mme N. N.). К вопросу о влиянии некоторых засыпок на развитие домовых грибов в древесине построек. [The effect of certain constructional fillings on the development of house fungi in constructional timber.]—*Bull. Leningrad Inst. for Controlling Farm and Forest Pests*, 3, pp. 39–43, 1932. [English summary.]

The results of the experiments briefly reported in this paper showed that of the materials commonly used in Russia to fill in the constructional interspaces in buildings (floors, ceilings, partition walls), clinker [scoriaceous residue from the combustion of coal, coke, and the like] and demolition rubble offer a greater resistance to the penetration of *Merulius lacrymans* and *Coniophora cerebella* from the surrounding timber than earth, clay mixed with straw, or sand. Lime and gravel proved to be practically impenetrable to these fungi, the latter chiefly owing to its very low water-holding capacity. The mycelium of *M. lacrymans* was shown to penetrate the fillings most readily at humidities of the environmental air approaching the saturation point, and a direct relationship was observed between the water-holding capacity of the filling material and its penetrability to either fungus.

VANINE (S. I.), ANDREYEFF (I. E.), & SOKOLOFF (D. V.). О влиянии домовых грибов на древесину, окрашенную масляными красками и лаками. [The action of wood-destroying fungi on wood coated with oil paints and varnish.]—*Bull. Leningrad Inst. for Controlling Farm and Forest Pests*, 3, pp. 45–56, 1 fig., 1 graph, 1932. [English summary.]

A brief account is given of controlled experiments, the results

of which [given in the form of tables] showed that pine wood impregnated or coated with creosote was not decayed to any visible extent at the end of three months from its inoculation with *Merulius lacrymans*, *Coniophora cerebella*, or *Fomes pinicola*. All the commercial oil paints or varnishes tested gave only partial protection against invasion of the wood by these fungi; the samples coated with white lead or zinc white, or with alcohol varnish were considerably less decayed than the others. Subsidiary experiments indicated that the controlling effect of the coatings is not due to any inhibitive action exerted by the paints or varnishes on the development of the fungi, but rather to the fact that they reduce the hygroscopicity of the wood, and also offer a mechanical barrier to the penetration of the organisms. Much of their protective effect depends on the thickness and continuity of the layers in which the paints or varnishes are applied.

VANINE (S. I.), ANDREYEFF (I. E.), VLADIMIRSKAYA (Mme N. N.), & SOKOLOFF (D. V.). Домовые грибы и консервирование древесины. [House fungi and timber preservation.]—Pamphlet issued by *Ленингр. Отд. Всесоюзнаго Инст. Сооружений.* [*Leningrad Branch of Pan-Soviet Inst. for Building*], Leningrad, 80 pp., 23 figs., 2 graphs, 1932.

The first of the three chapters into which this pamphlet is divided opens with an account of experiments, the results of which showed that the external mycelium of *Merulius lacrymans* and *Coniophora cerebella* is killed by 24 hours' exposure to an atmosphere containing 0·0052 gm. acetic acid or 0·033 gm. chlorine, or for one hour to one containing 0·1 gm. chloro-picrin, in 1 l. air. The lethal action of sulphur dioxide and formalin was less pronounced, and such substances as carbon disulphide, benzol, benzine, and sulphuric ether had a still weaker effect on the mycelium. Further tests showed that all these substances diffuse very slightly in a radial direction in dry timber, and only acetic acid and formalin penetrated to a depth of 3 mm.

The remainder of this chapter and the whole of the second reproduce papers by the individual authors on certain points in the biology and activity of the house fungi, the contents of which have been noticed from other sources [see preceding abstracts]. The third chapter deals with the practical side of timber [chiefly pine and fir] impregnation with fungicides.

VLADIMIRSKAYA (Mme N. N.). Разрушаемость камышитов под влиянием жизнедеятельности домовых грибов **Merulius lacrymans Schum.** и **Coniophora cerebella Schr.** [Decay of reed bundles caused by the activity of the house fungi *Merulius lacrymans* Schum. and *Coniophora cerebella* Schr.] —*Bull. Leningrad Inst. for Controlling Farm and Forest Pests*, 3, pp. 75–78, 5 figs., 1932.

After a passing reference to the increasing usage in Russia of reeds tied in bundles as material for filling in constructional interspaces [see preceding page], the author states that in controlled experiments such bundles were readily and completely rotted by *Merulius lacrymans* and *Coniophora cerebella* at high relative

humidities of the environmental air. Soaking the bundles in a 1 or 3 per cent. solution of triolith [*R.A.M.*, xi, p. 85] (the composition of which is stated to be 0·17 per cent. insoluble matter, 1·93 per cent. moisture, 5·12 per cent. chromium calculated as sodium dichromate, 76·86 per cent. sodium fluoride, and 15·93 per cent. organic and other substances), or in 5 per cent. zinc chloride, effectively preserved them from decay, even under optimum conditions for the development of the fungi, but copper sulphate solutions at concentrations as high as 10 per cent. were only partially effective.

HANSEN (H. P.). **Forsøg paa aktiv Immunisering af Kaalroe Brassica napus mod Rhizoctoniose.** [Experiments in the active immunization of Swedes (*Brassica napus*) against rhizoctoniosis.]—*Nordisk Jordbrugsforskning, 1932*, 5, pp. 191–200, 1932. [English summary.]

An experiment was conducted at the Royal Veterinary and Agricultural College, Copenhagen, to determine the practicability of active immunization [cf. *R.A.M.*, xi, p. 529 *et passim*] of swedes (*Brassica napus*) against infection by a strain of *Rhizoctonia* resembling *R.* [*Corticium*] *solani*.

Sterilized swede seeds were placed in Petri dishes on filter paper moistened with nutrients or the substances to be tested. On attaining a length of 2 cm. the seedlings were planted out in infected soil in trays, counts of healthy and diseased plants being made after three and ten days. Some of the seedlings were grown on filter paper moistened with the filtrate of 14-days-old *Rhizoctonia* cultures on 3 per cent. malt extract solution or clean water. Experiments were further carried out to test the effect of the expressed juice of plants grown on filter paper moistened with the fungus-filtrate, as well as of those naturally infected, and of healthy plants.

None of the above-mentioned methods resulted in the immunization of the plants.

A further test demonstrated the necessity of filtering the substratum to be tested through a bacterial filter, treatment of the seedlings with non-sterile expressed juice retarding infection by *Rhizoctonia* as compared with sterile. This is probably due to the antagonistic effect of contaminating organisms. The fungus was found to be capable of growth on sterile filtered expressed juice of seedlings infected by *Rhizoctonia*.

BROWN (J. G.) & EVANS (M. M.). **Two diseases of Peas new to Arizona.**—*Arizona Agric. Exper. Stat. Tech. Bull.* 44, pp. 289–324, 3 pl., 12 figs., 1 graph, 1932.

Dwarf Telephone and Stratagem peas on highly alkaline, heavy loam virgin soil at an altitude of some 4,400 ft. in the Chino Valley, Arizona, were severely attacked in 1930 by a foot rot characterized by death of the roots and stem bases and a more or less extensive yellow or brown discoloration of the leaves. A species of *Fusarium* was isolated from diseased material and inoculated into Premium Gem pea seeds, seedlings, and older plants with positive results. The fungus developed on a number of standard

media, giving a mycelium varying in colour from yellow or brownish to vinaceous or red, and producing true pionnotes of variable dimensions (50 to 52 by 57 to 60 mm. on autoclaved yellow maize meal). The conidial dimensions of six monospore cultures were as follows: 0-septate, 6·8 to 19·5 by 2·3 to 5·5 μ; 1-septate, 10·6 to 31·2 by 2·5 to 5·2 μ; 2-septate, 14·7 to 37·3 by 2·7 to 5·1 μ; 3-septate, 14·4 to 46·5 by 2·7 to 4·8 μ; 4-septate, 25·4 to 46·1 by 2·3 to 4·6 μ; 5-septate, 21·5 to 56·5 by 2·7 to 5·5 μ; and 6-septate, 41·1 to 104 by 3·4 to 11 μ. A few chlamydospores, 7 to 18 μ in diameter, were observed. The fungus is believed to be a hitherto undescribed variety of *F. merismoides*.

Bacterial blight of peas (*Phytomonas* [*Bacterium*] *pisi*) [*R.A.M.*, xi, p. 700] was observed, for the first time in the State, in the same locality as the foot rot in 1930. The organism was isolated from the diseased field peas and inoculated with positive results into the Canada field variety and the Laxtonian, Stratagem, Dwarf Telephone, and Premium Gem garden peas. Infection is believed to have originated in the seed. The cultural characters of *Bact. pisi* on a number of standard media at hydrogen-ion concentrations ranging from P_H 6·8 to 7·4 are given.

WOODWARD (R. C.). **Cercospora fabae Fautrey, on field Beans.**—*Trans. Brit. Mycol. Soc.*, xvii, 3, pp. 195–202, 1 pl., 1932.

Since 1927, when *Cercospora fabae* was recorded, apparently for the first time in England, on broad beans (*Vicia faba*) in Kent and Oxfordshire [*R.A.M.*, ix, p. 287], the fungus has been found to be widely distributed on the field varieties of *V. faba* over the whole of the country, causing chocolate-coloured spots on the leaves, which closely resemble similar lesions caused by other parasites and frost injury. Conidia of the fungus are not always readily observed on the spots in nature, but when present they may occur in silver-grey sori, situated on dead tissues, or they may occur around the outer circumference of the spots. Under controlled conditions, field bean leaves were readily infected through wounds with mycelium and spores of *C. fabae*, but infection of uninjured leaves was rarely obtained, and such as resulted remained limited and inactive. Parallel inoculation tests with *C. cantuariensis* [ibid., vii, p. 599] showed this fungus to be a very weak wound parasite on the field bean leaves. The experiments also suggested that *C. fabae* may produce black lesions on the stems of field beans in nature.

SIROTINA (Mme M.). Цитологическое изучение мозаики Сахарной Свеклы. [Cytological studies of Sugar Beet mosaic.]—*Наукові Записки з цукрової Промисловости* [*Sugar Industry Scient. Notes*], Kieff, ix [Grey Ser.], 24, pp. 195–216, 10 figs., 1932. [English summary.]

This is a detailed account of the author's cytological study of the leaves of apparently healthy sugar beet plants and of leaves from a small number of plants affected with the 'pointed' [dot], speckled [mottle], reticulate, and A_3 mosaics described by Mouravieff [*R.A.M.*, xi, p. 89]. In addition to other structural abnormalities [which are briefly discussed], the only dot mosaic plant examined

showed no differentiation of the mesophyll into palisade and spongy parenchyma, whereas in the other types of mosaic the palisade cells are merely shortened. In all cases the diseased tissues in the early stages of infection showed the presence of intracellular bodies, from simple spindle-shaped to more or less complicated flagellate and sigmoid forms of greatly varying size; such bodies were particularly numerous in the dot mosaic plant. They always were found only in the conducting tissues, never in the mesophyll. The fact, however, that similar bodies were abundantly found in the conducting tissue of the leaves from apparently healthy plants, and that they were absent in some plants exhibiting late acute symptoms of mosaic, throws considerable doubt on their pathological significance.

Other inclusions seen in the epidermal and parenchymatous cells of all the mosaic forms investigated, and occasionally also in the conducting tissue, were in the form of amorphous granular bodies up to 11 by 4 μ in diameter. In the younger leaves these bodies were usually very minute and in small numbers, and occurred chiefly around the fibro-vascular bundles. As the leaves grew bigger, and coincident with the appearance of the external symptoms of mosaic, the number and size of these bodies increased, and in mature leaves they were very abundant in the epidermis, their accumulation corresponding with the light mosaic spots on the leaves. It was also noticed that the appearance of these bodies usually preceded the development of the external symptoms. In the green areas the bodies were either totally absent or occurred in very small numbers, and they were never seen in apparently healthy plants. Further work is in hand to investigate the nature of these bodies and their causal relationship to sugar beet mosaic.

NIETHAMMER (ANNELIESE). **Die Beizung unseres Gemüsesaatgutes mit Germisan.** [The disinfection of our vegetable seed with germisan.]—*Gartenbauwissensch.*, vi, p. 650, 1932. [Abs. in *Fortschr. der Landw.*, viii, 3, p. 67, 1933.]

The effects of germisan on germination were tested on lettuce, cucumber, spinach, caraway [*Carum carvi*], parsley, and celery seed. The results of the experiments showed that cucumber, spinach, *C. carvi*, and parsley can safely be immersed for half an hour in a 0·125 per cent. solution, whereas lettuce tolerates only 15 minutes. With celery half an hour is probably also safe, but the after-ripening of the seed and germination temperature play an important part requiring further investigation, as is also to some extent the case with spinach and *C. carvi*. Root growth should be carefully watched in experiments of this nature, as it is strongly influenced by seed treatment. As regards disinfection, the method in question proved satisfactory for cucumber, parsley, and celery, partially so for *C. carvi* and spinach, and ineffectual for lettuce.

LUTHRA (J. C.) & BEDI (K. S.). **Some preliminary studies on Gram-blight with reference to its cause and mode of perennation.**—*Indian Journ. Agric. Sci.*, ii, 5, pp. 499–515, 5 pl., 2 graphs, 1932.

The gram (*Cicer arietinum*) crop in the North Punjab has been

heavily damaged by blight, the fungus responsible for which was identified as *Phyllosticta rabiei* [*R.A.M.*, xii, p. 137], notwithstanding its somewhat smaller pycnidia (185 by 155 μ compared with 200 by 167 μ for the type species). All the aerial parts of the plants were affected, the stem, branches, petioles, leaflets, and pods bearing brown lesions, the portions above which wilt and bend over. The fungus germinated in 8 to 16 hours in gram seed or leaf extracts at 15°, 20°, and 25° C., but not at 8° to 10° or 32°. Inoculation experiments on *C. arietinum* plants in pots gave positive results after four days. Seeds have been found naturally infected in the pod by *P. rabiei*, which appears to penetrate from the ovary wall into the testa at the point of contact and thence to pass to the cotyledons. The hyaline, branched, septate hyphae of the fungus have been found in and between the cells of the testa and cotyledons. The germinative capacity of the diseased seeds is usually reduced (from 99·3 to 44·6 per cent. in 100 healthy and infected seeds examined), the weight of the latter being only 3·95 as compared with 12·57 gm. Field observations and experiments [which are described] showed that *P. rabiei* is carried on the seed.

VIALA (P.). **Climatologie, viticulture et situation économique en 1932.** [Climatology, viticulture, and the economic situation in 1932.]—*Comptes rendus Acad. d'Agric. de France*, xviii, 29, pp. 966–973, 1932.

The writer states that the vine mildew [*Plasmopara viticola*] epidemic of 1932 in the south-east of France was the most disastrous ever experienced, surpassing even those of 1915, 1928 and 1930 in intensity and rapidity of progress [*R.A.M.*, xi' p. 764; xii, p. 73]. During the wet months of June, July, and September the ravages of the fungus were still further aggravated by the lack of heat and sunlight. At one period fresh attacks of mildew were observed daily for eleven days in succession. Attention is drawn to the very serious financial consequences of the epidemic, especially in small vineyards, and figures are given showing the reduction of yield in a number of localities as compared with 1931.

MANUEL (H. L.). **Bordeaux spray versus dusting powders for the control of Vine diseases.**—*Agric. Gaz. New South Wales*, xliii, 11, pp. 848–850, 1 pl., 1 fig., 1932.

The results of experiments in 1930–1 and 1931–2 confirmed the superiority, already indicated by previous work [*R.A.M.*, x, p. 75], of Bordeaux mixture over dusts in the control of the vine diseases in New South Wales, especially of black spot or anthracnose [*Gloeosporium ampelophagum*]. The cost of dusting is also stated to be much greater per acre than that of spraying under the local conditions.

Plant diseases.—*Tenth Ann. Rept. Min. of Agric. Northern Ireland 1930–1931*, pp. 38–41, 1932.

In the section of this report briefly reviewing investigations into plant diseases in progress in Northern Ireland during the period

under review [cf. *R.A.M.*, xi, pp. 396, 413, 746], it is stated that observations indicated that the failure of the oat crop on some farms in County Down in certain seasons may be due to *Helminthosporium avenae* [ibid., ix, p. 225; xii, p. 163]. Leather rot of strawberries (*Phytophthora*) [*cactorum*: ibid., xi, p. 559] was present on one plantation in County Armagh.

VOELKEL [H.] & KLEMM. **Die hauptsächlichsten starken Schäden an Hackfrüchten im Jahre 1932.** [The principal heavy losses in root crops in the year 1932.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xii, 12, pp. 101–103, 5 maps, 1932.

The copious rains of the summer of 1932 caused heavy damage to root crops in Germany. Blackleg of potatoes (*Bacillus phytophthorus*) was widespread in East Prussia and in parts of the central and western districts. Scab (*Actinomyces*) [*scabies*] was responsible for severe damage throughout the country, reductions of yield up to 50 per cent. being reported. The Industrie variety was extensively attacked. Late blight (*Phytophthora infestans*) completely destroyed some of the crops in East Prussia, while elsewhere the losses were also considerable.

Root rot of sugar and fodder beets (*Pythium de Baryanum* and other fungi) was prevalent in north-west Germany, Silesia, and East Prussia; in parts of the last-named province over half the seedlings were attacked, necessitating the ploughing up of the fields. Heart and dry rot [ibid., xii, p. 2] caused heavy losses (up to 50 per cent. of the crop) in Hanover, East Prussia, and Lower Silesia, Saxony ($\frac{1}{5}$ to $\frac{1}{3}$), Westphalia (up to 40 per cent.), and the Rhine Province ($\frac{1}{3}$).

SUNDARARAMAN (S.). **Administration Report of the Mycologist for the year 1931–2.**—17 pp., [? 1933.]

Observations on varietal reaction to blast (*Piricularia oryzae*) [*R.A.M.*, xi, p. 223] in late maturing rices at Coimbatore, Madras, showed that the most susceptible was Korangu samba (A.E.B. 3) which gave 92·48 per cent. diseased tillers, 65 units yield, and 50·77 per cent. chaff; the corresponding figures for Co. 6 being 86·01, 50, and 50; for Adt. 2, 83·92, 50, and 40; for E.B. 24, 2·25, 62, and 29·03; for Co. 1, 6·87, 65, and 38·46; and for Co. 4, 1·22, 43, and 30·23. Eight other varieties tested exhibited an intermediate range of attack.

Fusarium foot rot of rice [ibid., xii, p. 11] was very conspicuous on the Garikasannavari variety in the Godavari Delta and on Gobi-kar and Gobi Ayyan samba in Coimbatore. Control consists in seed treatment, only 1·1 per cent. of the plants grown from seed soaked for 30 minutes in 2 per cent. copper sulphate solution becoming affected; seed-bed treatment with 1 per cent. copper sulphate gave 2 per cent. diseased plants, whereas the untreated control plot showed 10·1 per cent. infection. E.B. 24 was absolutely immune, and Kistnakatukulu, Akkulu, Nallarlu, Atragada, and Vankisannam showed commendable resistance.

Sugar-cane mosaic [ibid., xi, p. 223; xii, p. 192] was found to reduce the weight of the cane by at least 10 per cent. (the average weight of one healthy and one diseased cane being, respectively,

1·54 and 1·39 lb.), the percentage of sucrose (from 15·55 to 13·96), and the purity of the juice (glucose increased from 1·14 to 1·47).

Seedling blight (*Colletotrichum*) of Uppam cotton [loc. cit.] was controlled by the use of healthy seed, spraying twice in the seedling stage, wider spacing in sowing, and removing the secondary hosts, *Aristolochia bracteata* and *Hibiscus ficulneus* [*H. diversifolius*]. Saltation yielded four additional strains of the fungus and generally occurred in alkaline media (up to P_H 8) where the depth of the medium was shallow. Infection was favoured by a soil moisture range of 37·5 to 50 per cent. of the water-holding capacity of the soil.

The following hosts (in descending order of susceptibility) were successfully inoculated with *Macrophomina phaseoli*: black gram [*Phaseolus mungo*], green gram [*P. mungo* var. *radiatus*] [ibid., viii, p. 423], French bean [*P. vulgaris*], gingelly [*Sesamum indicum*], mustard, sunflower, niger seed [*Guizotia abyssinica*], jute [ibid., x, p. 613], and sunn hemp [*Crotalaria juncea*]. On Czapek's agar the optimum growth occurred between P_H 4·6 and 6·2 for the gingelly strain and 4 and 6·2 for the black gram strain.

The *Fusarium* identified as *F.* [*oxysporum*] *cubense* [ibid., ix, pp. 64, 730] isolated from wilted bananas gave positive results in artificial inoculations.

'Pollu' disease of pepper [*Piper nigrum*: ibid., ix, p. 87] was caused by the combined attack of *Colletotrichum necator* and the flea-beetle *Longitarsus nigripennis*: in two varieties the percentage of attack in diseased berries averaged 11 for the insect as against 7·5 for the fungus.

Sclerotium rolfsii was isolated from wilted ragi (*Eleusine coracana*) and in culture developed aborted fructifications 0·3 to 8 mm. in diameter on the germination of the sclerotia. There was no stalk and the subhymenial layer was composed of a thin layer of tissue, over which was a layer of loose, interwoven hyphae ending in broadened terminal hyphae forming a compact band.

Manns (T. F.) & Adams (J. F.). **Department of Plant Pathology.** —*Ann. Rept. Delaware Agric. Exper. Stat. for the fiscal year ending 30th June, 1932* (*Bull.* 179), pp. 43–55, 2 maps, 1932.

In further tests on the control of tomato seedling diseases carried out in co-operation with Van Haltern at Tifton in Georgia [*R.A.M.*, ix, p. 227], the results indicated that treated seed, plus six applications to the seedlings of Bordeaux mixture (4–4–50) or oxo-Bordeaux (4–50) [ibid., xii, p. 240] as well as treated seed without subsequent spraying gave plants that remained practically free, when transferred from Georgia to Delaware, from the bacterial disease caused by *Aplanobacter michiganense*, which was very severe (47 per cent.) in the plants from the untreated control plot. Subsequently *Alternaria solani* and *Septoria lycopersici* developed slowly on all the plants, though apparently absent from the seedlings when received, thus indicating that both these fungi are spread locally by winds [ibid., x, p. 224].

Tests showed that many common mineral fungicides, such as mercuric chloride and copper sulphate, have little or no power of penetrating deeply into the soil, by which they are quickly

absorbed, but that certain organic substances such as formaldehyde and acetic acid penetrate rapidly and do not seem to become fixed in the top soil.

Infection of young peach leaves with *Bacterium pruni* [ibid., xi, p. 355; xii, p. 145] during the first half of the growing season caused defoliation more rapidly than foliage infections in the latter half of the season. On 16th April, 1931, opening leaf buds were inoculated with five-day-old bouillon cultures of *Bact. pruni*, terminal and lateral buds being exposed to the inoculum by dipping and spraying, so that a heavy load of bacteria was introduced; no infections, however, developed. The first evidence of canker exudations was found on 18th June, 1931.

The [tabulated] results of spraying different apple varieties with various sulphur and copper spray materials and combinations showed interesting variations with one and the same material on different apple varieties in the same block. Evidence was also obtained that the spreader or sticker used with certain sulphur sprays reduced the fungicidal efficiency of the latter. Fish oil (0·5 per cent.) and sodium oleate (0·5 per cent.) increased spore germination of *A. solani* and *Venturia inaequalis*, the former substance giving 91·8 and 77·8 per cent. germination for the two organisms, respectively, and the latter 89·2 and 80·9 per cent., as compared with 59·1 and 55·4 per cent. germination in the controls. They also increased germ-tube growth by 50 to 75 per cent. Two brands of calcium caseinate increased spore germination, but did not accelerate germ-tube growth to the same extent as fish oil or sodium oleate.

Further isolations from infected strawberry roots consistently showed the presence of species of *Actinomyces* [ibid., xi, p. 355], but direct inoculations with the organisms on exposed roots in damp chambers gave negative results.

Botany and plant pathology section.—*Ann. Rept. Iowa Agric. Exper. Stat. for the year ending June 30, 1932*, pp. 32–46, 1 fig., 1932.

Further work by C. S. Reddy and E. W. Lindstrom on the resistance of maize to infection by *Basisporium gallarum* [*Nigrospora* sp.: *R.A.M.*, xi, p. 498], using inbreds, F_1 crosses, and backcrosses of differentially susceptible lines, showed that resistance is inherited as a dominant character. The correlation between the acidity of the mature cob tissues and resistance to *Nigrospora* still appears to be relatively high, and there were also indications that infection is influenced by the date of planting, growth rate, and hardness of the cob.

I. E. Melhus found that, on land previously under maize, plants from nearly disease-free seed showed 12 per cent. crown infection by *Diplodia zeae* [loc. cit.] compared with 18 per cent. in those from seed inoculated with the fungus. At maturity 80 per cent. of the plants with severe crown infection were invaded to the second internode.

Sixteen physiologic forms of crown rust of oats [*Puccinia lolii*: loc. cit.] were identified by H. C. Murphy among 127 cultures collected in 1931 from the United States, Canada, and Mexico.

Four of these were hitherto unknown in North America, increasing the number of forms identified in that continent from 28 to 32. Physiologic forms 1 and 7 were again the most prevalent. Only three varieties of oats, namely, Bond C.I. No. 2733 (of Australian origin), Victoria C.I. No. 2401, and Glabrota C.I. No. 2630, are resistant to the most common form, the two first-named being resistant to all 32 forms and the first of these to the local forms of loose and covered smut [*Ustilago avenae* and *U. kolleri*], though highly susceptible to stem [black] rust [*P. graminis avenae*]. Hybrids between Bond and certain prolific, black rust-resistant varieties, e.g., Victoria, have been selected in the F_3 and F_4 generations as homozygous for resistance to all the above-mentioned diseases.

J. J. Wilson made observations on the behaviour of the melon variety Pride of Muscatine (K–S 4) which is resistant to wilt (*Fusarium niveum*) in two infested fields, one of which (No. 1) had been under melons for six consecutive years, while the other (No. 2) had not. On 3rd July, the plants showed 25 per cent. wilt in field No. 1 and 3·2 per cent. in No. 2, the number of deaths on 5th October amounting to 43 per cent. in the former and 11 per cent. in the latter. Among the control (Kleckley Sweet) plants there was 68 per cent. infection on 3rd July [ibid., xii, p. 197].

Under controlled greenhouse conditions S. M. Dietz infected *Chenopodium album*, *Rumex acetosella*, *R. crispus*, *R. altissimus*, and spinach with *Cercospora beticola* [ibid., xi, p. 498], while inoculation tests with *C. davisii* [*C. zebrina*: ibid., ix, p. 319] gave positive results on *Melilotus alba* var. *annua*.

In addition to *Fusarium zonatum* form 1, *Phoma terrestris* was isolated by I. E. Melhus and W. J. Henderson from onion plants suffering from seedling blight and bulb rot [ibid., xi, pp. 162, 421]. The tips of the leaves die and the roots may be found in all stages of decay. Rotting of the bulbs takes place both in the field and during storage.

The virus of yellow dwarf of onions [ibid., xi, p. 760] in sterile distilled water, stored at 29° C., was found by the same investigators to be inactivated after 112 hours, and in diseased leaves, at the same temperature, in 100 hours. The thermal death point of the virus lies between 75° and 80°. Its virulence was not impaired by ten minutes' freezing at −10°. Among the 35 onion varieties tested in the field for three years, the Riverside Sweet Spanish has shown a high degree of tolerance to yellow dwarf. In inoculation tests with diseased onion juice on a number of flowering bulbs and legumes, only the Chinese sacred lily (*Narcissus tazetta* var. *orientalis*) and the true jonquil [*N.*] (*odorus* [var.] *rugulosus*) contracted the yellow dwarf symptoms; which were transferred back to onions from these plants. Most of the Pleasant Valley onion growers have their sets and mother bulbs indexed by members of the Station staff for the presence of yellow dwarf, with the result that the disease is now practically under control.

Good control of damping-off in nine species of conifer seedlings was again given in G. L. McNew's experiments by aluminium sulphate applied to the soil at the rate of up to 1½ oz. per sq. ft. [ibid., ix, p. 8].

Golden or Japanese lily (*Lilium auratum*) bulbs from Japan were rotted in storage by an organism similar to the bread mould, *Monilia sitophila* [ibid., x, p. 501], which also occurred to a lesser extent on *L. speciosum* [vars.] *album* and *rubrum* and on *L. umbellatum*. Effective control was obtained in G. L. McNew's tests by 48 hours' immersion of the bulbs in a mercuric iodide-potassium iodide mixture.

Brown (J. G.). **Plant pathology.**—*Forty-third Ann. Rept. Arizona Agric. Exper. Stat. for the year ended June 30, 1932*, pp. 109–125, 4 pl., 1932.

During the past decade heavy losses have been caused in Arizona by bacterial rot or slime of lettuce [*R.A.M.*, viii, p. 635], especially among the spring crops exposed to high day and low night temperatures. The microscopic examination of lettuce leaves during periods with a wide daily range of temperature reveals ruptured tissues, the subsequent history of which, however, differs in normal and diseased material. With the latter, the bacteria enter the fissures, multiply, and disorganize the tissues by the wedging action of the bacterial mass, and probably also by the dissolution of the cell walls [cf. ibid., xi, p. 787]. The small, water-soaked spots on the leaves at (or sometimes before) heading time evidently result from stomatal infection. All the commercial lettuce varieties grown in the State appear to be susceptible to bacterial slime.

Several strains of Acala cotton have given promising results in respect of resistance to root rot (*Phymatotrichum omnivorum*) [ibid., viii, p. 240] and productivity. The fungus has been found attacking peach trees at an altitude of 3,500 ft.

An organism apparently identical with *Phytomonas* [*Bacterium*] *tumefaciens* was isolated from tumours up to 9 in. in diameter on *Cupressus arizonica*. Positive results were given by inoculations with it on *Ricinus communis*.

A study of the host range of the causal organism of leaf spot of date palms (*Graphiola phoenicis*) [ibid., xi, p. 572] showed that it is restricted to *Phoenix dactylifera*, the Canary Island palm (*P. canariensis*), and hybrids between the two.

Cytospora cankers have been found causing injury to weeping willows [*Salix babylonica*], walnuts, and pecans [*Carya pecan*], the last-named being apparently a new host. The species on pecan is very similar to *C.* [*Valsa*] *nivea* on poplars and cottonwood [*Populus deltoides*: ibid., x, p. 418]. The conidia on pecan range from 3·18 to 5·9 by 0·91 to 2·04 μ (average 4·38 by 1·17 μ), compared with 3·72 to 5·58 by 0·93 to 1·628 μ (average 4·77 by 1·32 μ) for *V. nivea* on *P. deltoides*. The latter was successfully inoculated with conidia from pecans. The spore horns of the walnut *Cytospora*, which appears to be associated with insect injury, are brown, whereas on transference to *P. deltoides* they assume an orange tint.

From ulcers in the gizzards of chickens a species of Aspergillaceae differing from *Aspergillus fumigatus* [ibid., ix, p. 184] was isolated. The fungus forms pale pinkish-buff or august-brown colonies on Czapek's solution agar in contrast to the green or nearly black ones

of *A. fumigatus*, and its development is exclusively sexual on all the media hitherto tested, whereas in *A. fumigatus* from poultry mycoses only the conidial stage is produced. On one ranch the loss of young chickens from this disease was 15 to 33 per cent. above the normal. Up to 100 per cent. infection was obtained on healthy chickens by oral inoculations with 5 c.c. of an ascospore suspension of the fungus.

Dowson (W. J.). **Notes on some bacterial plant diseases in Tasmania.**—*Journ. Pomol. and Hort. Science*, x, 4, pp. 301–305, 1932.

In this paper brief notes are given on four bacterial diseases of cultivated plants in Tasmania, two of which, namely, halo blight (*Bacterium medicaginis* var. *phaseolicola*) [*R.A.M.*, xi, p. 759] of dwarf beans [*Phaseolus vulgaris*] and bacterial spot (*Bact. maculicola*) on cauliflower [ibid., xi, p. 745], were first reported in that State in 1930–1. Walnut blight (*Bact. juglandis*) [ibid., xi, pp. 766, 772] has been known to occur there since 1912, causing considerable annual losses in practically all situations. Mulberry [*Morus* spp.] blight (*Bact. mori*) [ibid., xi, p. 756] was recently reported from a nursery at Hobart and from an orchard in the Spreyton district of northern Tasmania.

Morwood (R. B.). **Rust in Wheat.**—*Queensland Agric. Journ.*, xxxviii, 6, pp. 484–487, 1932.

This is a brief, popular account of wheat rusts [*Puccinia graminis* and *P. triticina*] which are stated to be almost invariably present in Queensland, sometimes practically ruining the crops. It is followed by a short discussion of control measures, chiefly by the use of resistant varieties of wheat, but also by early maturing ones which escape the worst attacks of rust. Among the latter, certain hybrids grown by Souttar in Queensland, such as Watchman, Novo, Beewar, and Bobs Indian Pearl Manitoba, are mentioned.

Petit (A.). **La transmission et le traitement des rouilles des céréales en Tunisie.** [The transmission and treatment of cereal rusts in Tunis.]—*Ann. du Service Bot. et Agron. de Tunisie*, ix, pp. 201–218, 1932.

The writer recapitulates his observations on the transmission of cereal rusts (*Puccinia* spp.) in Tunis, showing that infection is by air-borne uredospores, chiefly from volunteer plants [*R.A.M.*, xi, p. 436], and gives full details of a series of pot experiments in the control of the yellow, brown, and black rusts of wheat (*P. glumarum*, *P. triticina*, and *P. graminis*) by spraying and dusting. The Bump and Hussar varieties were used.

Complete control of yellow rust (the most severe of the three) was given by three dust treatments, viz., non-decyanurized precipitated sulphur, decyanurized precipitated sulphur Codex, and a mixture of 88 per cent. gypsum or lime, with 10 per cent. decyanurized precipitated sulphur, 1 per cent. paraformaldehyde, and 1 per cent. cyanamide. These treatments also reduced the incidence of brown rust, while the last-named was effective against

crown rust of oats [*P. lolii*]. Moderately satisfactory results were given by the following mixtures: 68 per cent. ground sulphur, 30 per cent. copper arsenite, and 2 per cent. saponin; 78 per cent. talc, 20 per cent. copper arsenite, and 2 per cent. saponin; 68 per cent. talc, 30 per cent. copper arsenite, and 2 per cent. saponin; lime or gypsum containing 5 per cent. paraformaldehyde; and 48 per cent. lime, 48 per cent. decyanurized precipitated sulphur, and 4 per cent. formaldehyde. A number of other treatments retarded the appearance of the rusts by a fortnight. Non-decyanurized precipitated sulphur exerted a toxic action on the wheat, as did also the ground sulphur or talc blends with copper arsenite, and ground sulphur-copper carbonate with or without talc. The best adhesive was found to be carbonate of lime. The first treatments should be given ten days before the expected development of the rusts and should be repeated at least twice; during the summer ten applications should be given at six-day intervals. Quite apart from their toxicity to the rusts, the dusts exert a so-called 'screening' effect on the plants, isolating them from environmental influences and thus from contamination by germinating spores [ibid., xii, p. 151].

None of the liquid treatments appeared to be promising.

Gassner (G.) & Straib (W.). **Die Bestimmung der biologischen Rassen des Weizengelbrostes. (Puccinia glumarum f. sp. tritici [Schmidt] Erikss. u. Henn.).** [The determination of the biologic forms of the yellow rust of Wheat (*Puccinia glumarum* f. sp. *tritici* [Schmidt] Erikss. & Henn.).]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xx, 2, pp. 141–163, 1932.

The results [which are fully discussed and tabulated] of inoculation experiments conducted at Brunswick with 17 lines of yellow rust of wheat (*Puccinia glumarum tritici*), comprising 14 biologic forms [*R.A.M.*, xi, p. 166], on numerous (313) varieties of the different *Triticum* groups led to the selection of the following nine *vulgare* varieties for differential purposes: Michigan Amber 29–1–1–1, Vilmorin Blé rouge d'Écosse (var. *milturum*), Strube's Dickkopf (var. *lutescens*), Webster C.I. 3780 (var. *ferrugineum*), Holzapfel's Early, Vilmorin 23, Heine's Kolben, Carsten's Dickkopf V (var. *lutescens*), and Spalding's Prolific (var. *milturum*). These suffice for the differentiation of 10 of the 14 biologic forms, but two supplementary varieties are recommended for the diagnosis of the closely related forms 2 and 3 (Noissy 1929 and Verrières 1930, the former also found at Verrières and Versailles and the latter at Giessen in 1931) and 13 and 14 (Olds, Alberta, Canada, and Jokioinen, Finland); these varieties are Rouge prolifique barbu (var. *ferrugineum*) for 2 and 3 and Chinese 166 (var. *erythrospermum*) for 13 and 14.

Michigan Amber proved highly susceptible to all 14 biologic forms of *P. glumarum* and Vilmorin's Blé rouge d'Écosse to all except 13 and 14. Strube's Dickkopf was highly susceptible to forms 1 to 8 and practically immune from the remaining six. Webster was more or less susceptible to forms 1 to 6, 9, 11, and 13, and Holzapfel's Early severely attacked by 1 to 4 and 9. Vilmorin

23 was susceptible only to forms 1 to 4 (2 and 3 most virulent), Heine's Kolben to 1, 9, and 10, Carsten's V to 5 and 7, while Spalding's Prolific was completely immune from forms 1, 4, 9, and 11 to 14, highly to moderately resistant to 3, 5 to 8, and 10, and susceptible only to 2. These infection types represent the reaction to the rust at a temperature of about 15° C., the plants being kept in diffused light, at a relative atmospheric humidity of 80 per cent., and receiving an adequate nitrogen supply.

Gassner (G.) & Straib (W.). **Über Mutationen in einer biologischen Rasse von Puccinia glumarum tritici (Schmidt) Erikss. und Henn.** [On mutations in a biologic strain of *Puccinia glumarum tritici* (Schmidt) Erikss. and Henn.]—*Zeitschr. Indukt. Abstammungs- und Vererbungslehre*, lxiii, 1–2, pp. 155–180, 1 fig., 2 diags., 1932.

From a monospore culture of the Emersleben strain [form 9: see preceding abstract] of yellow rust of wheat (*Puccinia glumarum tritici*) and its progeny a mutant developed in the ratio of 1·6 : 100,000 to 200,000 (approximate) characterized by marked differences in pathogenicity as compared with the parent form. The mutant is provisionally termed 'Neu-Emersleben'. Most of the varieties, especially of the Squarehead type, showing resistance to the Emersleben strain are heavily attacked by the mutant, Carsten's V and Krafft's Dickkopf, however, being exceptions to this rule. Among others resistant to the parent, but susceptible to the mutant, may be mentioned Bensing's Trotzkopf, Beseler's Dickkopf, Hörning's Dickkopf, Mette's Schloss, Pflug's Baltikum, Rimpau's Schlanstedter Dickkopf, Strube's Dickkopf, Svalöf's Panzer, and Vilmorin 23.

The formation of the mutant was observed in 34 cultures and it remained constant for over 30 generations. Its occurrence was first detected in greenhouse experiments at the end of 1930, and in the summer of 1931 it was observed to develop spontaneously in wheat plots at Kleinwanzleben near Magdeburg.

Hassebrauk (K.). **Gräserinfektionen mit Getreiderosten.** [Inoculations on grasses with cereal rusts.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xx, 2, pp. 165–181, 1932.

The writer discusses and tabulates the results of inoculation experiments at Brunswick on 182 grasses of German and foreign origin with one biologic form of each of the following rusts: *Puccinia glumarum tritici*, *P. graminis tritici*, *P. triticina* (all from wheat), *P. dispersa* [*P. secalina*] from rye, *P. simplex* [*P. anomala*] from barley, and *P. coronifera avenae* [*P. lolii*] from oats.

Pustule formation was induced by *P. glumarum tritici* form 4 [see preceding abstracts] on two Phalarideae, one of the Agrostideae, one of the Aveneae (*Gaudinia fragilis*), seven Festuceae (including *Bromus arvensis* and *B. inermis*), and 17 Hordeae, including rye, *Agropyron repens*, *Hordeum jubatum*, *H. maritimum*, and *Elymus* spp.

The biologic form of *P. graminis tritici* used in these tests was marked by its virulence towards the differential wheat varieties, Vernal, Acme, Kubanka, and Little Club, while Kanred, Khapli,

Arnautka, and certain others were immune. It infected one of the Aveneae (*G. fragilis*), 11 Festuceae (including five species of *Bromus*), and 18 Hordeae, including rye, barley, *H. bulbosum*, *H. maritimum*, *H. secalinum*, and *A. repens*.

P. triticina form 14 [ibid., viii, p. 366; xii, p. 15] produced positive results on two Aveneae (*Avena nuda* and *G. fragilis*), six Festuceae, and 16 Hordeae, including rye, barley, *H. bulbosum*, *H. maritimum*, *Agropyron*, *Aegilops*, and *Elymus* spp.

A local collection of *P. secalina* infected one of the Festuceae (*B. sterilis*) and seven Hordeae, including *H. maritimum*.

P. anomala form 2 [ibid., xi, p. 36] infected *Avena nigra*, *A. strigosa*, *H. bulbosum*, and *H. maritimum*.

A local form of *P. lolii* gave positive results on one of the Phalarideae, six Agrostideae (including *Phleum pratense*), 11 Aveneae (including *Avena fatua*, *A. strigosa*, *Arrhenatherum elatius*, and *G. fragilis*), 15 Festuceae (including *Cynosurus cristatus* and *Dactylis glomerata*), and two Hordeae (*Aegilops cylindrica* and *H. maritimum*).

Considerable differences were observed in the reaction of grasses from different localities to the same biologic form. The results of the author's trials indicate that, in general, the limits of the different biologic forms are by no means so sharply defined as suggested by Eriksson and Klebahn, but that, on the contrary, the host ranges of the various forms are liable in many cases to overlap.

Gassner (G.) & Hassebrauk (K.). **Ueber die Beeinflussung der Rostanfälligkeit durch Eintauchen geimpfter Blätter in Lösungen von Mineralsalzen und anderen Stoffen.** [On the influence on rust susceptibility of the immersion of inoculated leaves in solutions of mineral salts and other substances.]—*Phytopath. Zeitschr.*, v, 4, pp. 323–342, 4 figs., 1 graph, 1933.

The results of experiments in which inoculated wheat leaves were immersed for three to four nights in solutions of mineral salts and certain other substances agreed in the main with those of earlier soil fertilization tests, the outcome of the present trials, however, being even more clear-cut in respect of the modifications in susceptibility to brown rust (*Puccinia triticina* form 14) [see preceding abstract] induced by the different treatments [*R.A.M.*, xi, p. 98; xii, p. 15]. The plants were grown in pots and the green parts immersed during the night by inversion over solution jars with perforated lids.

The resistance of the moderately susceptible v. Rümker's Sommerdickkopf and the susceptible Strube's Dickkopf was greatly augmented by the potassium phosphates (potassium dihydrogen phosphate, dipotassium hydrogen phosphate, and tripotassium phosphate, the first at $\frac{1}{16}$, $\frac{1}{32}$, and $\frac{1}{64}$ mol., the second at $\frac{1}{32}$, $\frac{1}{64}$, and $\frac{1}{128}$ mol., and the third at $\frac{1}{48}$, $\frac{1}{96}$, and $\frac{1}{192}$ mol.) and potassium bicarbonate ($\frac{1}{32}$ mol.). Potassium nitrate caused little increase of resistance, while the effects of potassium sulphate and potassium chloride were intermediate. The resistance of both varieties was further strongly increased by disodium hydrogen phosphate and trisodium phosphate ($\frac{1}{32}$ and $\frac{1}{64}$ mol.).

On the other hand the susceptibility of v. Rümker's Sommerdickkopf was accentuated by ammonium nitrate, followed in decreasing order by ammonium sulphate, ammonium chloride, urea, glycocol, ammonium phosphate, magnesium nitrate, asparagin, calcium nitrate, potassium nitrate, and sodium nitrate. In a further test it was shown that an increase of susceptibility resulted from the combined application of glucose and ammonium nitrate (10 : 2 and 15 : 1 to 1·5 per cent., respectively). The efficacy of the ammonium nitrate solutions was found to depend on the presence of sufficient carbohydrates, larger quantities of the former (1 to 2 per cent.) being tolerated with a simultaneous supply of sugar than when given alone.

The application of these data to the natural occurrence of brown rust is discussed.

DUSSEAU (A.). **Sur le comportement de Triticum haplodurum et des formes issues du même croisement vis-à-vis des différentes maladies du Blé manifestées en 1932.** [On the reaction of *Triticum haplodurum* and of other strains of the same cross to the various Wheat diseases observed in 1932.]—*Rev. Path. Vég. et Ent. Agric.*, xix, 8–9–10, pp. 236–237, 1932.

The type line 1–1 of *Triticum haplodurum* (resulting from a cross of two *T. vulgare* varieties and morphologically resembling *T. durum*, but with a chromosome number of 2n = 14, relating it to *T. monococcum*) remained in 1932 immune from yellow rust (*Puccinia glumarum*) which was very widespread on other wheats in the valley of the Rhone, and was but slightly attacked by black rust (*P. graminis*), while other lines of the same cross were fairly severely infected by the latter. In the spring its leaves developed a necrotic spotting, isolations from which yielded a *Helminthosporium* and various other fungi; this disease, which was not seen on any other of the numerous wheats grown, is being investigated. In one locality up to three ergot sclerotia (*Claviceps purpurea*) were found per ear in the line 1–2 of *T. haplodurum*, this being stated to be the first record of ergot on wheat in the region of Valence.

CHURCHWARD (J. G.). **The geographic distribution of Tilletia spp. on Wheat in Australia in 1931.**—*Proc. Linn. Soc. New South Wales*, lvii, 5–6, pp. 403–408, 2 maps, 1932.

The results of a survey of the occurrence of wheat bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*] in Australia in 1931 showed that both were widely distributed and prevalent in most of the wheat-growing areas; *T. foetens* was the predominating species, excepting in Victoria, where *T. caries* only was collected. The distribution of the two species is shown in two maps.

CLARK (J. A.). **Registration of improved Wheat varieties, VII.**—*Journ. Amer. Soc. Agron.*, xxiv, 12, pp. 975–978, 1932.

Yogo (C.I. No. 8033), a cross between Minturki and Beloglina-Buffum, is a prolific, winter-hardy wheat showing a high degree of resistance to bunt [*Tilletia caries* and *T. foetens*] in five years' trials in Montana (1928–32). The average incidence of infection in

Yogo, Newturk, Karmont, and Turkey was 11·4, 85·7, 100, and 117·1, respectively.

VIENNOT-BOURGIN (G.). **Essais sur la carie du Blé en 1932.** [Studies on Wheat bunt in 1932.]—*Rev. Path. Vég. et Ent. Agric.*, xix, 8–9–10, pp. 257–284, 1 pl., 2 figs., 2 graphs, 1932.

The author describes in some detail the pathological changes observed by him in wheat plants of the Bon Fermier variety (very susceptible to bunt) grown in 1932 at Grignon in soil artificially inoculated with spores of *Tilletia tritici* [*T. caries*: *R.A.M.*, xi, p. 22]. The sowings were made in pots in the laboratory and later the seedlings were transplanted in the field. The results of careful investigation of the diseased plants showed that infection with bunt brought about: (1) a considerable reduction in the number of stems produced by the stools, due to a loss of some 50 per cent. of the tillers more than in the controls, occurring during the vegetative period of growth between the commencement of elongation of the stem and the development of the ears; (2) a reduction in the height of the culms (average 73·85 cm., compared with 126·4 in the controls) due not so much to a shortening of the internodes as to a decrease in their number, with consequent formation of a large number of late-maturing or entirely sterile stems; and (3) a modification in the anatomical structure of the culm. Instead of being quite hollow, the infected internodes were half filled with a fibrillose pith, becoming spongy and soft at the level of the node, and the latter was thickened and contained a large core of pith. While the healthy culm walls are constituted of a very compact sclerenchyma with thick polyhedral cells deeply staining with safranin, a very reduced assimilating parenchyma with small cells, and regularly disposed vascular bundles, in bunted stalks the walls consist of a rather loose sclerenchyma with irregular cells staining very faintly with safranin, and a very reduced assimilating parenchyma made up of very irregular patches of cells of average size, the disposition and number of the vascular bundles remaining unchanged. Comparable changes were also seen in the anatomical structure of the nodes. The general effect of infection is to preserve the wheat stalks in a juvenile, soft condition for an abnormally long period. At the time when the straw changes colour, the diseased spongy tissues of the culms shrink through loss of water, and the leaf sheaths become detached from the stem, depriving the latter of a large measure of support; this, in conjunction with loss of turgidity, leads first to a bending down of the stalks, and later to their breaking, usually at the second node. Infection with bunt also brings about a reduction of the foliage, both through a decrease of the number of leaves and through a stunting of the latter in length and width.

Field observations on the incidence and development of yellow rust (*Puccinia glumarum*) on the bunted wheat plants, together with a few artificial inoculations of such plants with spores of the rust, showed that the diseased plants were more susceptible than the healthy [ibid., x, pp. 479, 589], but the author is inclined to believe that this increase in susceptibility is more apparent than real, and is due chiefly to the fact that, on the one hand, the bunted

plants remain for a longer time in a juvenile state [cf. ibid., xii, p. 211], and on the other, that for the same amount of inoculum the total area of foliage in bunted plants is considerably reduced, this producing an effect of a more intense infection. The chemical composition of the bunted wheat plant may, however, be also modified, as indicated by the fact that samples of bunted stalks preserved in methylated alcohol were deeply and uniformly stained brownish-black, while the colour of normal stalks was somewhat cleared by this treatment. [A summarized account of the author's results is given in *Comptes rendus Acad. d'Agric. de France*, xviii, 34, pp. 1144–1146, 1932.]

Hanna (W. F.). **The odor of bunt spores.**—*Phytopath.*, xxii, 12, pp. 978–979, 1932.

Since the publication of a recent paper by the writer and his collaborators in which the characteristic odour of wheat bunt spores was attributed to the presence of trimethylamine in *Tilletia levis* [*T. foetens*], but not in the single physiologic form of *T. tritici* [*T. caries*] available [*R.A.M.*, xii, p. 156], a faint smell of trimethylamine was detected in spores of the latter smut at the Versailles Station Centrale de Pathologie Végétale. A distinct odour of trimethylamine was further emitted by several forms of *T. caries* from Washington [ibid., x, p. 19]. It is evident, therefore, that trimethylamine may be present in the spores of some strains of *T. caries* and absent from others.

Using pure cultures from single secondary (apparently haploid) conidia, crosses have been made between *T. foetens* and the *T. caries* strain without trimethylamine. The F_1 hybrid spores resulting from this cross resemble those of the *T. foetens* parent [ibid., xi, p. 706] and emit an odour of trimethylamine, indicating that the factors for smooth spore wall and smell are dominant.

Aamodt (O. S.) & Malloch (J. G.). **'Smutty' Wheat caused by Ustilago utriculosa on Dock-leaved Persicary.**—*Canadian Journ. of Res.*, vii, 6, pp. 578–582, 1 pl., 1932.

The pale or dock-leaved persicary (*Polygonum lapathifolium*) in Alberta was found in September, 1931, to be infected by the loose smut, *Ustilago utriculosa* Nees, not hitherto known to occur in Canada. Diseased plants growing in a wheat field (Garnet variety) were harvested with the grain, which became mechanically infected by the spores in the threshing operation. The wheat thus contaminated appears to be subject to the usual extra cost of handling common to samples infected by bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*: cf. *R.A.M.*, x, p. 716]. The effect of *U. utriculosa* on the loaf colour was similar to that of bunt. I. L. Conners, of the Division of Botany, Ottawa, reports the occurrence of *U. utriculosa* on *P. pennsylvanicum* and *P. persicaria* in New Brunswick and Prince Edward Island, respectively.

Riehm (E.). **Fusariumkrankheiten des Getreides.** [*Fusarium* diseases of cereals.]—*Deutsche Landw. Presse*, lix, 52, p. 650, 1 col. pl., 1932.

A popular account is given of the *Fusarium* diseases of cereals

in Germany, including snow mould of rye (*Calonectria graminicola*) and the various manifestations of foot rot due to species of this genus [*R.A.M.*, xii, p. 157, and next abstract].

GENTNER (G.). **Schädigung der Keimwurzeln von Roggen und Weizen durch Fusariumbefall.** [Injury to the radicles of Rye and Wheat from *Fusarium* attack.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, x, 9–10, pp. 219–222, 1 fig., 1932.

Fusarium herbarum is stated to have been responsible for exceptionally heavy damage to rye and wheat in Bavaria in 1932, the incidence of infection on diseased samples of both hosts being over 95 per cent. as compared with 40 to 60 per cent. for the former and 30 to 50 per cent. for the latter in normal seasons [cf. *R.A.M.*, vii, p. 505; x, p. 514]. The very wet weather in July is thought to have favoured the development of the fungus. At low temperatures (8° to 10° C.) the radicles were destroyed by *F. herbarum*, an effect that was largely counteracted in the writer's experiments by seed disinfection with roggenfusariol.

GÄUMANN (E.). **Der Einfluss der Keimungstemperatur auf die chemische Zusammensetzung der Getreidekeimlinge I.** [The influence of the germination temperature on the chemical composition of cereal seedlings I.]—*Zeitschr. für Bot.*, xxv, 8–9, pp. 385–461, 19 graphs, 1932.

In connexion with studies on the influence of germination temperature on the chemical composition of cereal seedlings, the writer found that seedlings of Plantahof, an early ripening, white-, smooth-, and loose-awned Swiss wheat, grown at different germination temperatures, show a relationship between the germination temperature and the solubility of their cell wall substance by *Fusarium herbarum* [see preceding abstract]. A method is described by which it was possible to obtain from the germinating seeds a material free from soluble carbohydrates and starch, and consisting mainly of the cell wall substances. This was tested by exposure to the action of the enzymes of *F. herbarum* obtained by growth in Richards's solution for two to three weeks, trituration of the mycelium, and filtration of the expressed sap with subsequent purification of the enzyme. The cell wall substance of seedlings grown at high temperatures (21° to 23° C.) underwent dissolution half as easily again as that of those developing at 3° to 9°, when exposed to the action of the enzyme at P_H 5·28. The xylan curve (percentage of xylan in the cell wall substance of the seedlings germinating at various temperatures) was found to show a certain similarity with that for the solubility of the cell wall substance under the enzymatic action of *F. herbarum* at corresponding temperatures. The varying degree of solubility of the cell walls formed at different temperatures appears to be dependent on the proportions of the hemicelluloses, especially xylan, in the cell walls.

In a preliminary investigation of the effect of soil temperature on the invasion of wheat seedlings by *Gibberella saubinetii*, the graph of total incidence was shown to rise to a maximum at about

24° and remain there at higher temperatures, whereas the curve for slight infection falls above this point and that for severe infection continues to rise up to the highest temperature tested, 39° [cf. ibid., x, p. 721].

THOENES (H.). '**Die Weissährigkeit des Winterweizens.** [The 'white-eared' condition of winter Wheat.]—*Pflanzenbau, Pflanzenschutz u. Pflanzenzucht*, viii, 11, pp. 275–276, 1932.

Exception is taken to Neumann's statement (*Superphosphat*, p. 253, 1931) that the foot rots of wheat (*Ophiobolus* [*graminis* and *O. herpotrichus*] and *Leptosphaeria* [*herpotrichoides*: *R.A.M.*, xii, p. 159]) are readily preventable in Germany by applications before sowing of superphosphate and phosphoric acid. No doubt there have been individual cases of good control by this method, but the whole problem of the foot rots, with their varying manifestations, is too complicated to be thus easily solved. So far no remedy has been found uniformly applicable to all types of this very serious disease.

SPRAGUE (R.). **The influence of moisture on the development of the Cercosporella foot rot of winter cereals.**—Abs. in *Phytopath.*, xxii, 12, pp. 999–1000, 1932.

Cercosporella herpotrichoides [*R.A.M.*, xi, p. 503], the agent of a destructive foot rot of winter cereals in the Columbia Basin of Washington and Oregon, occurs in semi-arid prairie regions with an annual rainfall of 14 to 24 in., its optimum development being reached in districts with just below 20 in. Severe infection is favoured by a warm, moist March, followed by an equally moist, cool April and early May, especially when the plants have been forced by prolonged growth the preceding autumn. The disease is prevalent in fine sandy loam soil with plentiful moisture. With the advent of the dry season the drop in the surface soil moisture checks its further development. The soil moisture, which is directly correlated with seasonal precipitation, seems to determine the relative severity of this type of foot rot in different years.

Zur Frage der Schädigung des Saatgutes durch Trockenbeizen. [On the question of the injury of seed-grain by disinfectant dusts.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xii, 12, p. 103, 1932.

Rabien's statement that abavit B is injurious to cereal seed-grains kept for ten weeks at a temperature of 0° to 3° C. [*R.A.M.*, xi, p. 773] has been interpreted in certain quarters as reflecting on the merits of this preparation. It is expressly affirmed, therefore, on the authority of the German Plant Protection Service, that abavit B exercises no adverse effect on the germinability of seed-grain maintained under normal temperature conditions. It will, as heretofore, be included in the lists of officially recommended fungicides against wheat bunt [*Tilletia caries* and *T. foetens*], loose smut of oats [*Ustilago avenae*], and snow mould [of rye and other cereals: *Calonectria graminicola*].

VANDERWALLE (R.). **Contribution à l'étude des maladies charbonneuses de l'Orge.** [A contribution to the study of the smut diseases of Barley.]—*Bull. Inst. Agron. et des Stat. de Recherches de Gembloux*, i, 4, pp. 291–322, 4 pl., 1932. [Flemish, German, and English summaries.]

The writer's observations, near Gembloux, Belgium, on the occurrence of loose and covered smuts of barley (*Ustilago nuda* and *U. hordei*) revealed the presence, on plots of the Précoce de Vendée variety, of a distinct late type of the former attacking only the lower part of the ear. In some cases the spikelets affected by this type are bifid, while in others the primary ears of a plant remain intact and the secondary ones are completely smutted.

In greenhouse inoculation experiments on the seed, the ordinary form of *U. nuda* manifested a high degree of virulence, attacking not only the ears, but also the leaves and haulms, on which it produced pulverulent streaks resembling those formed on rye by *Urocystis occulta*. On the other hand, the late form of loose smut produces chlamydospores from mycelial aggregations exclusively in the ear, the symptoms on which recall those of covered smut since the sori are surrounded by a silvery sheath formed by the host tissues. The spores of the late form are intermediate in roughness between the finely echinulate ones of loose smut and the smooth ones of covered smut, and the dimensions in nature of the late form of *U. nuda* are 5·28 ± 0·0227 by 3·90 ± 0·347 μ, compared with 6·30 ± 0·0245 by 4·73 ± 0·227 μ for loose smut proper. The corresponding dimensions of the spores resulting from artificial infections carried out under glass were 6·83 ± 0·001 by 6·40 ± 0·05 μ and 6·05 ± 0·018 by 4·82 ± 0·0876 μ, the spores of *U. hordei* in similar conditions measuring 5·90 ± 0·0067 by 5·42 ± 0·0088 μ. The late form of loose smut is believed to result from natural hybridization between *U. nuda* and *U. hordei*.

The best control of *U. nuda* was given by three hours' immersion of the seed-grain in water at natural temperature followed by 8 to 10 minutes in water heated to 51° to 52° C. Attention is drawn to the possibility of control by two natural enemies of *U. nuda*, viz., a clavicorn insect, *Cartodere filum*, and the fungus *Trichothecium roseum* [*R.A.M.*, x, p. 321 *et passim*], the dense mycelium of which prevents the dissemination of the spores at the base of the spikelets.

GORDON (W. L.) & WELSH (J. N.). **Oat stem rust investigations in Canada.**—*Scient. Agric.*, xiii, 4, pp. 228–235, 1932. [French summary on p. 273.]

This is a summarized account of investigations from 1925 to 1930, inclusive, of the occurrence and distribution in Canada of physiologic forms of the oat stem rust (*Puccinia graminis avenae*) [*R.A.M.*, xi, p. 176; xii, p. 86], the results of which showed the presence in the 1,070 collections of the rust (mostly from western Canada) of six physiologic forms in addition to the three (1, 2, and 5) which were previously known to occur in the Dominion. The latter forms were the most prevalent, accounting for 96·5 per cent. of the total isolations; the other six forms, 3, 4, 6, 7, 8, and 9, were isolated rarely, although all of them were shown to be more viru-

lent than the three first found. An attempt was made to study the physiologic forms by hybridizing them on the barberry [ibid., ix, p. 356]; inoculations with sporidia, however, gave positive results only with form 8, and a study of the cultures thus produced showed the presence in them of forms 6, 7, and 8, indicating the heterozygous nature of the last-named form; a single aecidial cup, however, only yielded one physiologic form.

Some details are also given of breeding work, in which the Heigira Strain oat, resistant to forms 1, 2, 3, 5, and 7, was crossed with higher yielding but susceptible varieties, Banner, Star, and Victory. In the result, fairly high yielding strains were produced, which proved to be resistant to approximately 98 per cent. of all the isolations of physiologic forms of *P. g. avenae* made in Canada during the period under review. The inheritance of the reaction to stem rust of the adult plant in the field is apparently controlled by the same factors that govern the inheritance of the reaction of seedlings in the greenhouse. In a Heigira Strain × Banner cross this inheritance was found to be governed by a single dominant factor.

STEVENS (N. E.). **United States of America: an epidemic of bacterial wilt of Maize.**—*Internat. Bull. of Plant Protect.*, vi, 12, pp. 203–204, 1932.

Bacterial wilt of maize (*Aplanobacter stewarti*), which was unusually severe in many parts of the United States in 1930 and 1931, culminated in 1932 in an epidemic, the intensity and extent of which is probably unparalleled. Certainly this has been the worst attack since Stewart's description of the disease 35 years ago. Notes are given on the incidence of bacterial wilt in a number of north-eastern States [cf. *R.A.M.*, xii, p. 206].

SAVASTANO (G.). **Ricerche sperimentali sul marcio dei frutti degli Agrumi. I. Specie batteriche e fungine isolate ed alcune loro caratteristiche biologiche.** [Experimental researches on rotting of Citrus fruits. I. Bacterial and fungal species isolated and some of their biological characteristics.]—*Boll. R. Staz. Pat. Veg.*, N.S., xii, 3, pp. 306–340, 7 pl., 2 graphs, 1932.

After briefly discussing the economic aspects of citrus fruit rots as they affect Italian growers, and the factors affecting infection, the author gives a full account of inoculation experiments made on lemons and oranges with numerous organisms which attack these hosts in Sicily.

Inoculations of ripe lemons on the tree and in the laboratory with *Phytomonas* [*Pseudomonas*] *citriputeale* [*R.A.M.*, ix, p. 303] gave positive results in ten days. This organism, which penetrates the fruit only through wounds, causes much damage to hanging fruits in wet weather, especially if the rain is preceded by hail. It is very prevalent in the vicinity of Acireale from February to April.

Sicilian lemons are severely attacked by *Phytophthora citrophthora* [ibid., xii, p. 212], the leaves also being liable to infection. The disease (known locally as 'allupatura') causes less damage in

Sicily than in California (probably because of the higher grafting practised in the former country), but in wet localities it greatly reduces the winter crop.

Sclerotinia minor was isolated from fallen lemons near Acireale and from oranges in Catania, this being the first Italian record of the fungus. Inoculations with pieces of diseased tissue and mycelium at 20° to 21° C. caused after 48 hours a softening of the tissues and a slight chestnut discoloration resembling an oil spot. After four days the spots, which had darkened considerably, measured 55 and 42 mm. in diameter on the lemons and oranges, respectively. In culture the fungus formed very minute sclerotia in eight to twelve days. It penetrates unwounded fruit by contact.

Inoculations of oranges and lemons with *S. sclerotiorum* [ibid., x, p. 307], isolated from oranges, rapidly gave positive results. The fungus was found on the twigs of mandarin [*Citrus nobilis* var. *deliciosa*] and lemon at Acireale, and cross-inoculations from fruit to branches and *vice versa* gave positive results, as did inoculations of actively growing, tender lemon shoots. *S. sclerotiorum* has not yet been recorded as parasitic on citrus fruits in Italy, but it has very occasionally been observed in Sicily on fruits which have lain on the ground for some days during wet weather.

Penicillium digitatum [ibid., xii, p. 167] is the principal cause of decay among lemons arriving at the London market from Italy throughout the year, and especially from December to May. *P. digitatum* was found to rot a larger area in a given time than any other citrus fruit parasite, causing complete decay of lemons at 18° to 28° in less than four days; *P. italicum* requires ten days to produce the same effect. When the fruit is attacked by *P. digitatum* the paper wrapping is stuck to the skin and can be removed only in bits, whereas in infection by *P. italicum*, whatever its degree, the paper is easily removable without tearing. *P. italicum* prepares the way for the other species and when both fungi are present there is a slight, reddish discoloration towards the inner part of the albedo. At extremes of temperature combined inoculation caused more rapid rotting than either species separately. It appears that these two fungi are responsible for some 95 per cent. of the decay of Italian lemons on the London market, *P. digitatum* alone causing about 72 per cent.

Oospora citri-aurantii [ibid., ix, pp. 106, 450, 532, 628] was found on lemons arriving in London from Catania and on fallen fruits in Sicilian orchards. Inoculations of lemons in different stages of maturity showed that very ripe ones were those most rapidly attacked; green ones remained unaffected. Laboratory tests also showed that *O. citri-aurantii* passed more rapidly from diseased to healthy citrus fruits than any other parasite of citrus. When healthy lemons were placed in a damp chamber in contact with inoculated ones in an advanced stage of infection, penetration of sufficiently ripe fruit took place in three days at 20° to 21° and in four days at 15° to 16°; yellowish-green fruits often remained unaffected, infection, when it did develop, taking 14 to 15 days.

Penetration of healthy fruits by contact with diseased ones took place with *P. italicum* in 6 to 8 days at 18° to 21°, with *Phyto-*

phthora citrophthora in 5 to 6 days at 20° to 21°, while at the latter temperature *S. sclerotiorum* required 12 days, and *S. minor* and *Botrytis cinerea* 10 days each.

The paper concludes with recommendations for control through improved methods of picking, packing, and local transport.

RABINOVITZ-SERENI (D.). **Sopra una malattia batterica dei Limoni.** [On a bacterial disease of Lemons.]—*Boll. R. Staz. Pat. Veg.*, N.S., xii, 3, pp. 278–284, 1932.

In 1932 the author received from Sicily a few lemons showing near the distal end round depressions with a thin, raised edge, measuring 10 to 14 mm. in diameter, and at first light yellow, later darkening at the centre. The underlying tissues were dry and the disintegrated cells contained numerous bacteria. The external characters of the condition agreed with the description of those produced by *Bacillus citrimaculans* in South Africa [*R.A.M.*, v, p. 487].

In culture in various media the organism formed yellowish colonies; it was Gram-positive and though usually monotrichous occasionally had three or four lateral flagella. It is regarded as being very probably identical with *B. citrimaculans*. Inoculations of healthy lemon fruits with pure cultures of the organism gave positive results. The condition, which was also observed at Amalfi, is uncommon and unimportant, as it is confined to the fruit.

SAVASTANO (G.). **Una gommosi del Limone causata da 'Dothiorella'.** [A gummosis of Lemon caused by *Dothiorella*.]—*Boll. R. Staz. Pat. Veg.*, N.S., xii, 3, pp. 245–274, 6 pl., 1932.

Early in 1928 Sicilian lemons, on arrival at Covent Garden market in London, were affected by a dark violet rot resembling that due to *Diplodia* [*natalensis*], but caused by *Dothiorella ribis* [*Botryosphaeria ribis*], which was also subsequently isolated from the trunks of lemon trees affected with a dark amber-coloured gummosis in numerous localities in Sicily. Recorded also in Palestine and near Tunis, the fungus is probably to be found throughout the Mediterranean lemon-growing areas, though this is the first record of it there on the trunks of lemons [cf. *R.A.M.*, xi, pp. 172, 696]. Fawcett considers that the disease is more virulent in Sicily (where it is the most prevalent cause of trunk gummosis) than in California. Attack is favoured by bark injuries caused by wind, hail, or human agency.

In nature the pycnidia were depressed-globular and had papillate ostioles; in culture they generally measured 200 to 325 μ in diameter. The fusoidal, continuous, hyaline spores in culture measured 10 to 20 by 4 to 5·2 (average 15 by 5 μ). Old cultures gave a few septate spores, a character not reported by other workers. In nature the spores measured 14·4 to 16·8 by 5 to 7·4 μ (average 16 by 6 μ).

In natural infections the spread was slow at first, but in the second year the necrosed area measured 10 to 18·2 by 9 to 15·5 cm. Attack occurs nearly always above the graft.

Inoculations of the trunks of bitter oranges [*Citrus aurantium* var. *bigaradia*] gave positive results, and caused a brown exudate,

the woody tissues turning a light olive-brown or bluish-lavender. Inoculations of the trunks of two lemon trees gave affected areas measuring in the same period roughly three times as much as in the bitter orange, the diseased wood being dark violet and with a very characteristic odour. The effect of the inoculations was altogether more marked on lemon than on bitter orange. Inoculations of lemon branches also gave positive results, but showed more cicatrization tissue after two years than was present on the trunks. Inoculations of young lemon trees wounded in such a way as to simulate wind injury (by pulling and shaking the boughs) gave lesions, of a type closely similar to those found in nature, near the fork.

Evidence was obtained that before it can become truly pathogenic the fungus requires the presence of adult, mature bark. The inoculation results confirmed the observations on natural infections that the true pathogenic action of the fungus in the trunk and main branches is confined as a rule to the part between the graft and the fork.

Unwounded lemon fruits exposed to infection or tied to inoculated, rotting lemons and kept in a damp chamber at 23° C. for one month remained unaffected. When mycelium or pieces of diseased fruits were carefully kept in contact with the unwounded bark of lemon trees (the inoculum being renewed) no penetration took place in nine months. The organism is therefore definitely regarded as purely a wound parasite. The most consistently positive results on the fruit were given by removing the stalks and inserting pieces of mycelium between the fibrovascular bundles. Inoculations of lemon fruits with the organism obtained from trunk lesions gave positive results and *vice versa*.

The optimum growth temperature for the fungus was ascertained to be about 28°, the maximum about 32°, and the minimum under 10°. At temperatures up to 18° the mycelium remained whitish for the first three days, whereas at 20° or over it showed a characteristic dark colour. The organism lived *in vitro* for 22 months at −1° to +1°, for 15 months at laboratory temperature (15° to 26°), and for about 10 months at 20° to 21°.

Reichert (I.) & Hellinger (E[sther].). **Blemishes and their influence on the keeping quality of Oranges.**—*Hadar*, v, 12, pp. 287–292, 6 figs., 5 graphs, 1932.

Popular notes, based on observations made in three groves in 1930–1, are given on some types of blemishes affecting Palestine oranges and impairing to a varying extent the value and keeping quality of the fruit [cf. *R.A.M.*, xi, p. 780]. Silver scurf, which occurred on about 30 per cent. of the fruits, is due to a liberation of oil caused by the wind or insects chafing the cells and producing silvery, greyish, or brownish, irregular, scaly areas on the fruit. 'Faroosh' is characterized by a puffing and grooving of the rind [ibid., viii, p. 450], which tends to loosen from the pulp and is soft to the touch. This condition is usually attributed to irregularities of growth in the rind due to intermittent spells of drought and moisture, the former checking and the latter accelerating development. Sooty mould (*Fumago*) occurred on

9·9 per cent. of the fruit in the three groves. 'Nooksan' or 'missing flesh' is the name given to the shallow, sunken pox spots of variable dimensions on growing or stored fruit. This collapse of the cells between the oil glands, frequently observed in November, may be due to the action of hot, dry winds on the unripe fruits.

The total amount of entirely unblemished fruit in Palestine during the 1930–1 season was estimated at not over 30 per cent. Neither silver scurf nor sooty mould was responsible for any appreciable increase in the wastage of stored fruit. The average incidence of rind puffing was only 3·7 per cent., but the storage losses from this source were considerable (up to 20·7 per cent.). The 'missing flesh' disorder occurred on 2·4 per cent. of the fruit and caused a variable amount of wastage (0 to 5·2 per cent.).

MAYNE (W. W.). **Annual Report of the Coffee Scientific Officer, 1931–1932.**—*Mysore Coffee Exper. Stat. Bull.* 7, 32 pp., 1932.

Laboratory investigations conducted in Mysore during the period under review showed that the spores of *Hemileia vastatrix* did not germinate in the absence of liquid water, but that complete submersion exercised a depressing effect on the development of the germ-tubes. It was also ascertained that light had an inhibitory action on germination [*R.A.M.*, xi, pp. 563, 637]. Field observations showed that the severity of the annual attacks of coffee leaf disease is largely determined by the amount of heavy mist and dew occurring during the rainless months. Two collections of the spores of *H. vastatrix* kept in sealed tubes at laboratory temperature and medium humidity failed to germinate after six months. Inoculations of detached Coorg coffee leaves with spores taken from leaves of the same variety indicated that 7 to 12 days elapse between infection and the first appearance of a yellow spot, and 15 to 24 days between infection and the first appearance of spores. When susceptible Robusta leaves were inoculated much longer periods (20 and 29 to 35 days, respectively) were required for the development of visible spots and of spores.

Spore trap observations towards the end of the south-west monsoon showed that *H. vastatrix* was much more prevalent in areas sheltered from the wind than in exposed areas. The later development of the disease in wind-swept localities is considered to be due to many of the spores being carried beyond the limits of the coffee. The use of wind breaks to act as spore barriers merits consideration.

A type of coffee root disease somewhat resembling red root disease of tea (*Poria hypolateritia*) [ibid., xi, p. 749] was occasionally found in patches. Another, of some importance, near Gudalur, yielded a fungus which in growth characters resembled *Fomes applanatus* [*Ganoderma applanatum*]. Most of the trees affected with this disease showed few above-ground symptoms, but the tap-root wood was discoloured and emitted a mushroom-like odour; in advanced stages the wood was spongy and wet. The disease apparently progressed slowly, and almost invariably a dead stump was present near the affected tree; in one instance,

the spread of the disease along a large root of a dead stump to the dying coffee tree was definitely established.

In further tests of the relative effects of different spray mixtures [used chiefly against *H. vastatrix*: cf. ibid., xi, p. 41] on the coffee plant, the following figures were obtained for the number of leaves per growing shoot of each branch system treated: linseed Bordeaux mixture (10 oz. linseed) $6{\cdot}28 \pm 0{\cdot}23$; casein Bordeaux mixture $6{\cdot}19 \pm 0{\cdot}24$; fish oil-resin soap-Burgundy mixture $5{\cdot}66 \pm 0{\cdot}26$; resin soda-Bordeaux mixture $5{\cdot}95 \pm 0{\cdot}20$; alum Bordeaux mixture $6{\cdot}00 \pm 0{\cdot}28$; resin soda-Burgundy mixture $5{\cdot}97 \pm 0{\cdot}21$; 3 per cent. solbar $5{\cdot}12 \pm 0{\cdot}19$. The figures for the unsprayed control and for Bordeaux mixture without adhesives were, respectively, $3{\cdot}13 \pm 0{\cdot}17$ and $5{\cdot}40 \pm 0{\cdot}19$. The statistically significant differences between the figures obtained with and without casein suggest that adhesives are definitely advantageous, but in view of the relatively high figure obtained even without an adhesive and of the fact that the 1931 monsoon was very heavy, it is thought probable that the omission of an adhesive in the September-October spraying would not seriously affect the degree of protection afforded. Further evidence was obtained that the pre-monsoon application is more effective against *H. vastatrix* than the post-monsoon spraying.

GANDRUP (J.). **Phytopathologische problemen in de Koffiecultuur.** [Phytopathological problems in Coffee cultivation.] —*De Bergcultures*, vi, 51, pp. 1388–1397, 1932.

In the course of a lecture on phytopathological problems in coffee cultivation delivered at a recent meeting of the Planters' Union of Semarang-Kedoe, allusion was briefly made to two diseases of outstanding importance in Java, namely, brown root rot [*Fomes noxius*: *R.A.M.*, xii, p. 55] and top die-back associated with a species of *Rhizoctonia* [ibid., ix, p. 305; xi, p. 636, *et passim*]. A report of the ensuing discussion is given.

FIKRY (A.). **Investigations on the wilt disease of Egyptian Cotton caused by various species of Fusarium.**—*Min. of Agric., Egypt, Tech. and Sci. Service* (*Plant Protect. Sect.*) *Bull.* 119, 106 pp., 16 pl., 7 graphs, 1932.

This is a considerably amplified version of the author's account of his work in connexion with the wilt disease (*Fusarium orthoceras*, *F. vasinfectum* var. *inodorum*, and *F. angustum*) of cotton in Egypt [*R.A.M.*, xi, p. 513], giving a detailed description of the technique used in most of the experiments. Among other items of interest the paper includes a detailed study of the cultural characters of the pathogenic fungi on a number of media, and of the influence of certain environmental factors on the infective capacity of *F. orthoceras* and on the growth of cotton seedlings, the results of which are considered to explain the fact that the disease is most destructive in the summer months, when irrigation is at its highest. In all three species the colour of the mycelium was pure white in the dark, and pale pinkish in the light, and spores were formed more abundantly in the absence of light; there was some evidence also that more plants became wilted when kept

in the dark than when left exposed to light. None of the pathogenic or non-pathogenic forms isolated from wilted plants could grow in the absence of air, but they were still alive at the end of 12 days. Chlamydospores only were present in culture tubes kept sealed for two years, and these germinated readily when transferred to a fresh medium. Although the cotton plants did not show appreciable resistance to wilt when the carbon dioxide concentration in the atmosphere was increased to 30 parts in 10,000, they grew stronger and better at the high concentrations than in normal air.

Considerable details are also given of experiments to establish the effect of certain fungicides on the fungi and on cotton seedlings, when applied to the soil and to culture media. In the latter the growth of the fungi was inhibited by the presence of 0·1 per cent. of formalin, 0·7 per cent. of copper sulphate, or 0·01 per cent. mercuric chloride; cut plants wilted in all the fungicidal solutions tested, except in 0·003 per cent. mercuric chloride. Under glasshouse conditions in experiments carried out in England the wilt fungi could be controlled without injury to the plants by applications to the soil of 0·4 per cent. formalin or 0·5 per cent. copper sulphate (calculated to the total weight of the soil). When Egyptian heavy clay soils were used, similar results were given by 0·4 per cent. or 1·25 per cent. of these substances, respectively, these doses having no injurious effect on the cotton. Mercuric chloride had a depressing effect on the germination of the seed and on plant growth, and is not recommended.

King (C. G.) & Hope (C.). **Distribution of the Cotton foot-rot fungus in soil and in plant tissues in relation to control by disinfectants.**—*Journ. Agric. Res.*, xlv, 12, pp. 725–740, 7 figs., 2 diags., 1932.

This is a detailed account of incidental observations that were made during an attempt in 1930 to eradicate the cotton root rot fungus (*Phymatotrichum omnivorum*) [*R.A.M.*, xii, p. 216] from an isolated area near Indio, California, by means of a 1·25 per cent. formalin solution introduced under pressure to a depth of 6 ft. in the soil [ibid., xi, p. 713]. Methods are also briefly described, which were evolved during the work and served for the detection of the fungus even where no indicator plants were present. It was found that the organism is able to exist in an active condition for a long period on the roots of removed trees, and that the mycelium inside such roots resisted the action of the disinfectant for a longer period than that outside; the latter was always found to be dead about 10 months after the treatment, at which time all the sclerotia of the fungus that were examined were also dead, while sclerotia from a culture kept in the laboratory remained viable at the end of two and a half years. Laboratory tests showed that all the parts of a sclerotium are capable of giving a mycelial growth.

Further observations both in that area and elsewhere indicated that the distribution of the sclerotia in infected soil is very uneven, both vertically and horizontally. In one locality a few were found at a depth of 84 to 90 inches.

Zeisler (E. P.). **Chronic coccidioidal dermatitis. Report of an unusual case.**—*Arch. of Dermatol.*, xxv, 1, pp. 52–71, 16 figs., 1932.

A full account is given of an unusual case of extensive chronic dermatitis due to *Coccidioides immitis* [*R.A.M.*, xii, p. 217], which is believed to have entered through the skin and to have been contracted from a dog. The histologic changes produced by the growth of the fungus in the tissues in the form of nodules surrounding the blood vessels suggest dissemination by the blood stream. In one section of a growing nodule a peculiar type of endosporulation was observed, the cyst being about twice the usual size and containing few spores, with a clear, hyaline, central, spherical spore taking the nuclear stain and a segmental peripheral distribution of the remaining spores in a radial fashion. This form is stated to have been seen only once previously, by Rixford and Gilchrist. Ordinarily the cysts contain numerous small, evenly distributed spores.

Gougerot [H.] & Duché [J.]. **Endomycose ulcéreuse végétante du nez due à Endomyces albicans.** [A spreading ulcerous endomycosis of the nose due to *Endomyces albicans.*]—*Bull. Soc. Franç. de Dermatol.*, *1932*, 9, p. 1624, 1932.

Endomyces albicans [*R.A.M.*, vi, p. 484] was isolated from a spreading ulcer on the nostril of a female patient.

Catanei (A.). **Die Blastomykosen in Nordafrika.** [The blastomycoses in North Africa.]—*7ª Reunion Soc. Argentina Patol. Region Norte*, i, pp. 222–226, Buenos Aires, Imprenta Univ., 1932. [Abs. in *Zentralbl. für Bakt.*, Ab. 1 (*Ref.*), cix, 7–8, p. 160, 1933.]

Since 1911 five cases of human blastomycosis have been recorded in Tunis, Morocco, and Algeria, caused by *Mycoderma brocianum*, *Monilia castellanii* [*R.A.M.*, v, p. 98], and *Enantiothamnus braulti*. A description is given of a sixth case in an Algerian woman with an ulcerous affection of the arm, from which *Cryptococcus montpellieri* Catanei 1926 [previously cited in error as *C. catanei*: ibid., vi, p. 32] was isolated and inoculated into rabbits and guinea-pigs with positive results.

Mazza (S.) & Palamedi (B.). **Ein Fall tödlich verlaufener Blastomykose an Haut und Schleimhaut.** [A case of blastomycosis of the skin and mucous membrane with a fatal outcome.]—*7ª Reunion Soc. Argentina Patol. Region Norte*, i, pp. 424–467, 1 pl., 50 figs., Buenos Aires, Imprenta Univ., 1932. [Abs. in *Zentralbl. für Bakt.*, Ab. 1 (*Ref.*), cix, 7–8, pp. 159–160, 1933.]

The development of an abscess on the toe of a labourer was followed three months later by ulcers of the oral membrane, tongue, and gums, with ultimate extension to the throat, respiratory tubes, and lungs, resulting in death. The causal organism was identified as an undescribed species of *Monilia* which is named

M. inexorabilis. A full account is given of the morphology and physiology of the fungus and its pathogenicity to animals, together with clinical details of the case.

PEUTZ (J. L. A.). **Primaire aspergillose der longen.** [Primary aspergillosis of the lungs.]—*Nederl. Tijdschr. voor Geneeskunde*, lxxvi (i), 5, pp. 446–451, 1 pl., 1932. [French, English, and German summaries.]

A young man employed in a carpet and tapestry business in Holland suffered from a chronic illness resembling pulmonary tuberculosis. *Aspergillus fumigatus* was isolated from an abscess in one of the lungs and is considered to be the direct cause of the disease [cf. *R.A.M.*, x, p. 28].

MERIIN (J. A.). **Weitere Beobachtungen über den Erreger der europäischen Chromoblastomycosis.** [Further observations on the agent of European chromoblastomycosis.]—*Arch. für Dermatol.*, clxvi, 3, pp. 722–729, 6 figs., 1932.

Two further cases of chromoblastomycosis due to *Hormodendrum rossicum* [*R.A.M.*, x, p. 314] in Russia are described. The new strains differ from that previously reported ('W') primarily in the smaller size of the spherical bodies (6 to 12 μ as compared with 11 to 36 μ) in the pus. In one strain ('R') nodular forms were observed which appear to denote a variant. From this strain a filtrate was obtained that gave a specific reaction on intradermal injection. Strain 'R' was pathogenic to rats and mice but not to guinea-pigs.

LEHNER (E.). **Über einen Fall von Acremoniosis.** [On a case of acremoniosis.]—*Arch. für Dermatol.*, clxvi, 2, pp. 399–404, 1932.

Details are given of a Hungarian case of acremoniosis, the primary manifestation of which was a centrifugally progressive, chronic erythemato-vesicular affection of the hands, whence the causal organism passed into the blood stream and ultimately caused the development of lesions resembling erythema multiforme and erythema annulare on the body and extremities. A vaccine prepared from the fungus (a species of *Acremonium*) [*R.A.M.*, xii, p. 219 and next abstract] induced a strongly positive reaction in the patient at a dilution of 1 in 500, accompanied by excessive susceptibility to contact with certain plant (e.g., geranium) leaves. Since acremoniosis is an extremely rare disease, the fungus normally being scarcely pathogenic, it is thought that the susceptibility to the plant antigen developed first and combined with the fungus antigen to produce the above-mentioned effects.

BALLAGI (S.). **Mykologische Beschreibung der Acremoniosis.** [Mycological description of acremoniosis.]—*Arch. für Dermatol.*, clxvi, 2, pp. 405–407, 2 figs., 1932.

Lehner's *Acremonium* [see preceding abstract] was cultured on Sabouraud's medium, on which it formed white, later yellow, and eventually hazel-nut-coloured colonies, echinulate in the centre with peripheral convolutions. The mycelium is hyaline, glistening,

with a tendency to coremial formation, and consists of septate hyphae, 3 to 4 μ in diameter. The conidiophores range from 15 to 30 μ in length and 3 to 4 μ or more in breadth and bear at their apices hyaline, glistening conidial heads, measuring 16 to 25 μ and consisting of numerous oval conidia, 2 to 3 μ in diameter, developed singly at the extremity of the conidiophore. The optimum temperature for the development of the fungus is 18° to 20° C.; no growth was made at 37°. The organism proved to be practically innocuous to guinea-pigs. In glucose and peptone cultures the colonies developed a pinkish coloration and a 'down' resembling the pleomorphic 'duvet' of the dermatophytes [cf. *R.A.M.*, xi, p. 373].

MILLER (H. E.) & MORROW (H.). **Cephalosporiosis: an unusual mycotic infection.**—*Arch. of Dermatol.*, xxv, 2, pp. 294–303, 10 figs., 1932.

A species of *Cephalosporium* (*Acremonium*) [see preceding abstracts] was isolated from a gumma-like lesion of the soft palate and tonsillar region of a young man in California, this being apparently the first record of such a condition in the United States. Attention is drawn to five other cases recently reported in foreign literature. The fungus was characterized by a very delicate mycelium with ellipsoidal conidia at the ends of fairly long, thread-like conidiophores. In six- to twelve-week-old cultures there was a central blackish-grey, powdery elevation composed of conidia. No gas was produced in any sugar media, but gelatine was liquefied in three to four weeks. The optimum temperature for growth was 18° to 20° C., failure commencing at 37° and death occurring in 24 hours at 40°. The fungus was non-pathogenic to laboratory animals.

KAMBAYASHI (T.). **Botanische Untersuchungen über japanische Fadenpilze, die auf der Menschenhaut parasitieren.** [Botanical studies on Japanese Hyphomycetes that parasitize the human skin.]—*Bot. Mag.*, Tokyo, xlvi, 552, pp. 751–771, 3 pl., 25 figs., 1932.

Microsporon japonicum, the agent of a human ringworm in Japan [*R.A.M.*, ix, p. 525], is characterized by hyaline, straight or slightly undulating, sparsely branched, septate hyphae, 2 to 3·5 μ in width; rudimentary conidiophores bearing sessile, spherical, oval to piriform conidia, 4 to 5 by 2 to 3·5 μ; 'racquet'-like hyphae, 2 to 4·5 μ in width, and (in older cultures) completely atypical lateral branches developed near the septa and forming a profusion of short, fasciculate, irregularly elongated-cylindrical, elliptical, or polyhedric elements. Spherical to oval or irregularly shaped chlamydospores, 12 to 19 by 4 to 9 μ, with occasional spindle spores, are also developed, and twice (in old cultures, 261 days and about two years, respectively), ascus-like bodies containing a variable number (4 to 12) of cell inclusions, presumably ascospores, were observed.

The cultural characters of *M. japonicum* are stated to be quite distinct from those of the 27 species of *Microsporon* described by Bruhns and Alexander (Handbuch der Haut- und Geschlechts-

krankheiten von Jadassohn, xi, pp. 54–61, 121–145, 1928). The centre of the colony on glucose or maltose agar is brownish-yellow to chocolate-brown, with brownish-yellow to reddish peripheral radiations.

Smyth (H. F.) & Smyth (H. F.). **Action of pine oil on some fungi of the skin, in vitro.**—*Arch. of Dermatol.*, xxvi, 6, pp. 1079–1085, 1 diag., 1 graph, 1932.

The results of tests to ascertain the action of pine oil and certain of its purified components on cultures of various ringworm fungi are reported. The various organisms showed fairly clear-cut differences in resistance to the oils, proportionate in some degree to the severity of the infections they cause. One strain of *Trichophyton granulosum* [*R.A.M.*, x, p. 458], responsible for the most severe infections of this group, was killed in one hour by fenchyl alcohol and in 30 minutes by 'very pale yellow' pine oil, while another succumbed only to alpha-terpineol in 30 minutes. The oils were only effective at a strength of 100 per cent. *T. interdigitale* [*T. mentagrophytes*: ibid., x, p. 243], to which Weidman (*Arch. of Dermatol.*, xv, p. 415, 1927) attributes well over half the cases of ringworm in the United States, was killed in four of the five strains tested within five minutes by the 'very pale yellow' oil, while the fifth strain was only slightly affected after 30 minutes. Two strains of *T. purpureum* were killed in 10 to 15 minutes and *E. inguinale* [*E. floccosum*] and *Microsporon fulvum* [ibid., vii, p. 634] in five minutes by the 'very pale yellow' oil, while *Sporotrichum schenckii* [ibid., xi, p. 646] was not killed after five hours by this substance, but succumbed to alpha-terpineol, fenchyl alcohol, and white pine oil in 1½, 1, and 5 hours, respectively.

Jenkins (Anna E.) & White (R. P.). **Identification of Diaporthe umbrina on Rose from England.**—*Mycologia*, xxiv, 6, pp. 485–488, 2 pl., 1932.

Examination of material of brown canker of the rose sent from England is stated to have established that the causal fungus, apart from slight cultural differences, is identical with *Diaporthe umbrina* previously reported from the United States alone [*R.A.M.*, x, p. 666; xii, p. 25].

Taubenhaus (J. J.) & Ezekiel (W. N.). **Sclerotinia wilt of greenhouse Snapdragons.**—*Amer. Journ. of Botany*, xix, 10, pp. 808–811, 1 fig., 1932.

Autumn greenhouse snapdragons [*Antirrhinum majus*] near Temple, Texas, were attacked in 1927 by a serious wilt disease causing the death of 60 per cent. of the plants with a financial loss of $20,000. The shrunken stems were covered with a copious white weft of mycelium with numerous large sclerotia, of which 466 were collected in an area of 64 sq. ft., 171 being formed on the surface of the diseased stems, 92 inside them, and 203 on the ground. The fungus apparently spreads by direct contact of the collapsed, infected plants with neighbouring healthy ones, as well as along the surface of the soil. It was isolated from diseased

material and identified as *Sclerotinia sclerotiorum* [*R.A.M.*, vi, p. 554]. Inoculation tests on snapdragons with the fungus from the same host, as well as from celery and beans, and with apothecia from under diseased fig trees [ibid., xi, p. 313], gave positive results, and the sclerotia thus produced yielded the typical apothecia, asci, and ascospores of *S. sclerotiorum*.

LEMESLE (R.). **Nouvelles recherches sur le Scabiosa succisa L. attaqué par le Fusarium anthophilum (A.Br.) Wr.** [Further studies on *Scabiosa succisa* L. attacked by *Fusarium anthophilum* (A.Br.) Wr.]—*Comptes rendus Acad. des Sciences*, cxcv, 25, pp. 1319–1321, 1 fig., 1932.

Further studies on the mechanism of infection of *Scabiosa succisa* by *Fusarium anthophilum* [*R.A.M.*, ix, p. 654] revealed the presence of abundant mycelium within the ovule, the hyphae penetrating by way of the micropyle. So densely are the hyphae aggregated that neither the embryonal sac nor the elements forming the inner coating of the tegument can be discerned. The lower part of the ovule is often covered with mycelium which extends down the longitudinal axis of the carpel to the base of the ovarial cavity. The infected ovules are usually abnormally small, but in no case has complete atrophy been observed, and as a rule the flowers retain their natural blue colour. In a few instances of discoloration of the corollas the fungus was found on the anthers, style, and stigmas.

MCWHORTER (F. P.). **A preliminary analysis of Tulip breaking.** —Abs. in *Phytopath.*, xxii, 12, p. 998, 1932.

The common variegated flower colour of tulips known as 'breaking' or 'mosaic' [*R.A.M.*, xi, p. 718] is believed to result from the action or interaction of two viruses, one of which carries a colour-adding factor and produces no visible effect on the leaves, while the other removes the flower colour and causes marked striping of the foliage. Certain varieties, when 'broken', tend to segregate into plants or parts of plants (clumps) bearing strongly darkened or markedly bleached flowers. By means of selection and the use of inoculum prepared from the parts of flowers where the colour was removed and darkened, respectively, the viruses have been secured in an almost pure state. The colour-adding virus has little effect on plant growth and may be of practical value in the development of 'new' varieties. The colour-removing principle, on the other hand, is extremely virulent, reducing plant growth to one-third of the normal. Cross-inoculations with the juice from leaves of mosaic [*Lilium*] *speciosum* plants indicate that these contain a virus indistinguishable from that of the bleaching virus of tulips.

WHETZEL (H. H.) & DRAYTON (F. L.). **A new species of Botrytis on rhizomatous Iris.**—*Mycologia*, xxiv, 6, pp. 469–476, 2 pl., 1 fig., 1932.

A morphological and cultural account is given of a hitherto undescribed species of *Botrytis*, which is named *B. convoluta* n.sp., and which since 1924 has been observed causing a serious rot of

the rhizomes of species of *Iris* at Ithaca, N.Y., Washington, D.C., and near Ottawa, Canada. The same fungus is stated to have been intercepted during the past ten years on several occasions by the United States Customs on iris rhizomes imported from France, Germany, England, and Holland.

In the field affected plants either fail to develop new leaves in the spring, or a few shoots may develop which later turn yellow and die by midsummer; the plants are easily pulled out of the ground, owing to the decayed condition of the root system. The rhizomes are shrivelled and partially or completely rotted; the diseased flesh is grey-brown, dry and pithy, with distinct rifts in the decaying tissues, but with no disagreeable smell. On the surface of the rhizomes or breaking through the epidermis are agglomerations of characteristically convolute, shiny black sclerotia. The pathogenicity of the fungus was proved by successful inoculations of healthy rhizomes in the laboratory. There was evidence that it gains entrance to the host tissues in nature through wounds, and that its pathogenic activity occurs only during the colder part of the year.

B. convoluta [a Latin diagnosis of which is given] is characterized by a branching, septate, hyaline (later tan-coloured) mycelium, forming shiny black, convolute, agglomerated sclerotia up to 18 by 16 mm. in diameter. The conidiophores, arising on the mycelium and sclerotia, are brown, erect, fasciculate, branched at the apex, and about 1 mm. high. The conidia are light brown, continuous, smooth, ovate to slightly piriform, borne in dense clusters, and varying in size from 7 to 19 by 5·25 to 12·75 μ (mode 11 to 11·75 by 9 to 9·75 μ, and average 11·41 by 9·25 μ in nature, but somewhat smaller when produced in culture). The appressoria are of the *B. cinerea* type. Microconidia have been observed in pure cultures of the fungus. They are globose, hyaline, 2·5 to 4·5 μ in diameter, and produced on typical fasciculate conidiophores.

Nannizzi (A.). **Nuove specie di micromiceti parassiti o saprofiti su piante coltivate.** [New species of micromycetes parasitic or saprophytic on cultivated plants.]—*Arch. Bot.*, viii, pp. 296–301, 1932. [Abs. in *Riv. Pat. Veg.*, xxii, 9–10, pp. 326–327, 1932.]

Notes are given on the following new species found in the Botanical Gardens, Siena: *Phyllostictella draconis* on living leaves of *Dracaena draco*, *Septoria iridis-japonicae* on living leaves of *Iris japonica*, on which it caused severe injury, and *Coryneum feijoae* on living leaves of *Feijoa sellowiana*, together with several saprophytic species found on various plants.

Hammarlund (C.). **Zur Biologie des Mahonia-Rostes (Puccinia mirabilissima Peck). (Vorläufige Mitteilung).** [On the biology of the *Mahonia* rust (*Puccinia mirabilissima* Peck). (Preliminary note).]—*Bot. Notiser, 1932*, 6, pp. 401–416, 2 figs., 1 map, 1932.

Details are given of the writer's inoculation experiments with *Puccinia mirabilissima* on *Mahonia* [*Berberis*] *aquifolium* leaves

[*R.A.M.*, xi, p. 580]. The tests were conducted with aecidiospores, basidiospores, and uredospores on both young and old leaves. The inoculations with basidiospores were successful only on young foliage, whereas those with aecidio- and uredospores gave positive results mainly on older leaves. These results are in agreement with the observations made in nature, aecidia never being found on older leaves while uredosori are seldom detected on young foliage. The genetic connexion between the aecidial and teleutospore stages of the rust was clearly established by the author's inoculations, and notes are given on the distinguishing characters of the aecidia of *P. mirabilissima* and those of *P. graminis*, which were also found to be not uncommon on *B. aquifolium* in Sweden [see below, p. 330].

Teleutospores occur most frequently in the north of the country, where the climatic conditions are extremely severe, and are relatively seldom formed in the milder southern and western regions.

Blattný (C.) & Vukolov (V.). **Mosaik bei Epiphyllum truncatum.** [Mosaic of *Epiphyllum truncatum*.]—*Gartenbauwissensch.*, vi, p. 425, 2 figs., 1932. [Abs. in *Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliii, 2, pp. 88–89, 1933.]

A virus disease, characterized by scanty, retarded flowering and shedding of buds, and in severe cases by premature death, was observed in 1929 on the cactus *Epiphyllum truncatum* grafted on *Peireskia aculeata* [? in Czecho-Slovakia]. The disturbance, which is macroscopically distinct from the allied conditions of albicatio and chlorosis [*R.A.M.*, xi, p. 387], was experimentally shown to be transmissible by *Orthezia insignis* and by the sap of affected plants; the typical symptoms could further be induced in *E. truncatum* scions by injecting the diseased sap into the tissues of the *Peireskia* stocks. The disease appears to be favoured by dryness of the soil and atmosphere as well as by high temperatures.

Dorph-Petersen (K.). **Beretning fra Statsfrøkontrollen for det 61. Arbejdsaar fra 1 Juli 1931 til 30 Juni 1932.** [Report of the State Seed Testing Service for the 61st year of activity from 1st July, 1931 to 30th June, 1932.]—*Tidsskr. for Planteavl*, xxxviii, 5, pp. 713–792, 1932.

Section viii of this report (pp. 757–759) contains some items of phytopathological interest [cf. *R.A.M.*, xi, p. 304]. Figures are given of the numbers of samples of various grass seeds in which sclerotia of *Claviceps purpurea* were found. Sclerotia of the closely related *C. microcephala* were found in 7 out of 50 samples of rough-stalked meadow grass [*Poa trivialis*] and in 29 out of 61 of meadow grass [*P. pratensis*]. They are, moreover, practically ubiquitous in creeping bent grass [*Agrostis stolonifera*] samples.

Similar data are given for the occurrence of *Sclerotium trifoliorum* and *Typhula trifolii* in clover seed, *Ustilago perennans* in that of *Avena elatior*, *U. bromivora* in *Bromus arvensis*, *Tilletia holci* in *Holcus lanatus*, and *Erwinia* [*Phytomonas*] *rathayi* in *Dactylis glomerata* seed.

SCHLIESING. **Erfolgreiche gemeindeweise Schädlingsbekämpfung im Obstbau.** [Successful community spraying against orchard pests.]—*Nachricht. über Schädlingsbekämpf.*, vii, 4, pp. 131–133, 1932.

Highly satisfactory results are stated to have been obtained in the Osnabrück [Westphalia] district by community spraying against fruit diseases and pests with solbar and nosprasit 'O' [*R.A.M.*, xii, p. 33] in 1 per cent. solutions, using 3 to 8 l. per tree.

WALLACE (T.). **The effect of orchard factors on the storage quality of fruits.**—*H[ortic.] E[ducational] A[ssoc.] Year Book*, i, pp. 71–75, 1932.

Five years' investigations at Long Ashton, Bristol, have shown that the storage quality of fruit is strongly affected by factors operating in the orchard. These are (a) material factors, comprising class of fruit, variety, rootstock, and age of tree; and (b) environmental and management factors, the former including climate, weather, soil, and parasites, and the latter soil treatments, cultural and manual operations, parasite control, time of picking, size grading, handling, and crop weight. From a knowledge of all these, a fairly accurate idea of the storage quality of a consignment may be obtained; some, such as drastic deficiencies of nitrogen or potassium, produce dominant influences which determine the main storage characters of a consignment. The effect of the individual factors on breakdown and in one or two instances on rots is briefly discussed.

HUBER (G. A.) & HEALD (F. D.). **The sources of contamination of the normal Apple and spore load.**—Abs. in *Phytopath.*, xxii, 12, p. 1001, 1932.

Fungous infection of apples is initiated in the orchard [*R.A.M.*, xii, p. 32], where analyses of the air at harvest time disclosed the presence of 25 to 500 spores per cu. ft. Apples carefully picked off the trees and so handled as to prevent further contamination bore from 14,000 to 159,100 spores each. Fruits from surface-irrigated plots each bore on an average 36,766 spores, the corresponding number for those from overhead-irrigated plots being 119,616. Dirty picking-boxes showed an average load of 108,050,160 fungus spores on the interior surface. A box with the maximum contamination carried a load of 109,958,400 spores on the inner surface of the bottom boards only, of which 32,987,520 were *Penicillium* types, mostly *P. expansum* [ibid., xii, p. 226]. The air in packing houses during the packing season yielded 32 to 994 spores per cu. ft., a reduction in the number being observed where sanitary measures were practised. The palms of gloves worn by sorters bore 12,100 to 40,000 spores per sq. in.

HOWITT (J. E.). **Apple orchard spray service in Ontario.**—*Scient. Agric.*, xiii, 4, pp. 256–259, 1932.

In giving some details of the organization of the apple orchard spray service in the province of Ontario, the author states that, owing to the conspicuously satisfactory results obtained since the first year of its inception in 1924, the service has gradually

extended until now it includes almost every apple-growing district in the province; from four orchards with which it began, the number under supervision rose to 1,374 in 1932, requiring the co-operation of fifteen local supervisors working under the direction of the heads of the service at the Ontario Agricultural College, Guelph.

GODBOUT (F. L.) & COULSON (J. G.). **Quebec orchard spray service.**—*Scient. Agric.*, xiii, 4, pp. 249–255, 1 map, 1932.

The authors give a brief description of the organization and working of the orchard spray service which was inaugurated in the province of Quebec in 1929, and is directed more particularly towards the control of the apple scab fungus [*Venturia inaequalis*]. Some details are also given of the results obtained in the study of the epidemiology and biology of the organism, most of which have already been noticed from time to time in this *Review*.

PARHAM (B. E.). **Apple and Pear black spot (scab). Comparative records of the ascospore discharge in Venturia inaequalis (Cke) Aderhold and V. pirina Aderh. throughout New Zealand in the spring of 1931.**—*New Zealand Journ. of Sci. and Techn.*, xiv, 3, pp. 184–192, 1932.

During the spring (August to December) of 1931, the writer obtained comparative records of ascospore discharge in the apple and pear scab fungi (*Venturia inaequalis* and *V. pirina*) from two districts (Auckland and Hawke's Bay) in North Island, and two (Nelson and Otago) in South Island, New Zealand [cf. *R.A.M.*, xii, p. 32]. The spores were trapped in the ordinary way on glass slides with a layer of gelatine in the centre.

The results [which are tabulated] of the investigation showed that in the Auckland district, ascospore discharge in apple leaves began in the week ending 26th August and ceased during the last week of October with the breaking-up of the foliage—otherwise the process would probably have continued since discharge was still active. Two periods of relatively high discharge occurred, viz., in mid-September and the second to the third week in October. The initial discharge of pear scab ascospores did not take place until the beginning of September in Auckland, but the process continued until the beginning of December, maximum activity being recorded at the end of September, second week, middle, and end of October, and first week of November. The discharge period for apple leaves in the Hawke's Bay district lasted from 11th September to 27th November, reaching a climax at the end of September, continuing heavy during the first week of October, and resuming activity in the third week of that month after a temporary decline. The pear leaf discharge in the same district extended only from 6th September to 25th October, with a peak during the latter half of September. At Outram, Otago, the ascospore discharge from both apple and pear leaves began in the last week of September; the foliage disintegrated during the second week of October, when the activity of both fungi was at its height. At Beaumont the discharge began a week earlier than at Outram and continued until the second week in December.

In the Nelson district the spring was unusually dry, and the discharge period consequently protracted. It began in apple leaves on 26th August and lasted until 21st December, the corresponding period for pears being 31st August to 17th December. The peak was not reached in the apple fungus until 3rd November, whereas the maximum discharge from pear foliage occurred during the first week of October.

These data are considered to indicate a fairly high degree of uniformity throughout New Zealand in 1931 in the behaviour of apple and pear scab, both as regards the commencement and duration of ascospore activity, and also the frequency and disposition of the peak periods. A seasonal comparison between records secured at Nelson in 1921 and 1931 further denotes a marked regularity in the behaviour of the fungi from season to season, both in respect of the total period of ascospore discharge and the regular occurrence of the maximum discharges for the season during the last week of September and the first fortnight of October.

Loewel (E. L.). **Schwefelkalk-Bleiarseniat oder Kupfermittel zur Bekämpfung des Fusikladiums?** [Lime-sulphur-lead arsenate or copper preparations for *Fusicladium* control?]—*Obst- und Gemüsebau*, lxxviii, 11, pp. 175–176, 1932.

Some further observations are made in connexion with the writer's investigations in the Altenland district [Schleswig-Holstein] on the relative merits of lime-sulphur with lead arsenate and various copper-containing preparations in the control of apple scab (*Fusicladium*) [*Venturia inaequalis*: *R.A.M.*, xii, p. 31]. The following schedule may be recommended as suitable for most of the local varieties (except Lord Grosvenor, to which lime-sulphur must not be applied after flowering on account of leaf russeting): middle of March to beginning of April, 10 per cent. carbolineum; middle of April, 2 per cent. Bordeaux mixture; beginning of May, 1 per cent. nosprasit or 0·4 per cent. Hercynia neutral; after petal fall and again in the middle of June, 2 per cent. lime-sulphur and 1 per cent. lead arsenate paste; and middle of July, 0·3 to 0·5 per cent. nosprasit.

Moore (M. H.). **Further studies on the incidence and control of Apple scab (Venturia inaequalis) and Apple mildew (Podosphaera leucotricha) at East Malling.**—*Journ. Pomol. and Hort. Science*, x, 4, pp. 271–294, 1932.

The results [which are tabulated and discussed] of continued experiments in 1930 at the East Malling Research Station on the control of apple scab (*Venturia inaequalis*) and apple mildew (*Podosphaera leucotricha*) [*R.A.M.*, x, p. 465] again confirmed the previous finding that on Cox's Orange Pippin lime-sulphur is the most satisfactory spray against both diseases, especially when applied three times, once before and twice after blossoming. When applied post-blossom only, at the strength of 1 in 100, it caused fruit drop, although the trees thus treated did not show any reduction in picked crop below that on comparable Bordeaux-sprayed or control trees. Bordeaux mixture again showed a

tendency to cause spray injury, and was ineffective against apple mildew and red spider [*Tetranychus telarius*]. The importance of the 'pink-bud' application of lime-sulphur, especially when severe infection with scab occurs early in the season, as in 1930, was also confirmed.

On Beauty of Boskoop apples, two post-blossom applications of 20–10–100 soda-soap solution, 1–100 lime-sulphur, and a sulphur dust, respectively, gave the best results against *P. leucotricha*. It is pointed out, however, that the sulphur dust should be used with caution, as it was of doubtful safety in 1929, although it caused no damage in 1930. Weak 1 in 150 lime-sulphur with 0·1 per cent. gelatine compared favourably with the stronger 1 in 100 spray with 0·4 per cent. lead arsenate but without gelatine, when applied twice post-blossom.

Confirmation was also found of the considerable influence exerted by the rootstock on the susceptibility of the trees to apple mildew, since Cox's Orange Pippin trees worked on East Malling No. I stock were pre-eminently susceptible, while those on Nos. XVI, IV, and XV were resistant. The same is also true, in the main, of the influence of the rootstock on susceptibility to scab, but it appeared to be governed, to some extent, by seasonal conditions.

Jancke (O.) & Lange (L.). **Über die Mehltauanfälligkeit unserer Apfelsorten.** [On the susceptibility of our Apple varieties to mildew.]—*Gartenbauwissensch.*, vi, p. 433, 1932. [Abs. in *Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliii, 2, p. 92, 1933.]

A survey is given of bibliographical references in the relevant horticultural and scientific literature to the reaction of apple varieties to mildew (*Podosphaera leucotricha*), supplemented by the results of eight years' experience with 98 varieties at a branch of the German Biological Institute [cf. *R.A.M.*, ix, p. 668]. No clear-cut correlation of general applicability could be found between climatic conditions and the occurrence of mildew, nor could the statements regarding the dependence of the disease on hot and dry or warm and moist summers be verified [cf. ibid., viii, p. 316]. On the other hand, confirmation was obtained of the prevailing opinion that the disease is more severe among crowded, ill-ventilated espalier plantings than in those of the same age and variety given plenty of space and air.

Baines (R. C.) & Gardner (M. W.). **Pathogenicity and cultural characters of the Apple sooty-blotch fungus.**—*Phytopath.*, xxii, 12, pp. 937–952, 2 figs., 1 graph, 1932.

Pure cultures which readily developed pycnospores of the sooty blotch fungus, *Gloeodes pomigena* [*R.A.M.*, x, p. 390; xii, p. 206], were obtained from the tissues of apple and crab-apple (*Pyrus coronaria*) fruits, as well as from the young twigs of 23 other hosts [which are enumerated] in Indiana, including wild blackberry (*Rubus allegheniensis*), *Sassafras variifolium*, red elm (*Ulmus fulva*), hard [sugar] maple (*Acer saccharum*), willow (*Salix nigra*), *Cornus rugosa* and *C. alternifolia*, *Liriodendron tulipifera*, *Cercis*

canadensis, white oak (*Quercus alba*), and *Smilax hispida*. Pycnidia with mature bicellular spores were found in late May and early June on the twigs of a number of these hosts and cultures obtained from them.

Under cool, moist conditions inoculations with spore suspensions of the cultures from fifteen of these hosts on green apples were successful in producing typical sooty blotch, the incubation period being two to three weeks. In the orchard infection was produced in one to two months on apples by inoculation with spores from cultures from ten of the above-mentioned hosts. No differences in the type of infection were produced by the cultures from different hosts.

The fungus developed well on a number of agar media, sporulation being promoted by malt and potato extracts. On potato-dextrose agar heaped, black, leathery colonies are formed with an abundance of spores exuding in gelatinous masses. The optimum temperature for growth was found to be about 20° C., a range of 18° to 27° being satisfactory for this purpose. Little or no growth occurred at a humidity of 90 per cent. or less. The fungus tolerates a wide range of hydrogen-ion concentration.

The morphology of *G. pomigena* is described. Below the superficial thallus on the apple cuticle, clusters of short hyphae may be observed penetrating a short distance into the cuticle. No penetration beneath the cuticle was observed. The pycnospores are unicellular when immature, then bicellular or sometimes tricellular. In culture they are formed in numerous cavities, apparently without distinct walls, at different depths in the thallus. On the host they are mostly 10 to 12 by 2 μ and in culture 12 to 14 by 2 to 3 μ.

KIENHOLZ (J[ESS] R.). **Perennial canker and anthracnose fungi: host relations and cultural differences.**—Abs. in *Phytopath.*, xxii, 12, pp. 995–996, 1932.

Gloeosporium perennans [the cause of perennial canker of the apple] was observed in nature on quince trees and fruits and the service berry (*Amelanchier pallida*) [*A. alnifolia*: in the Pacific Northwest] in 1931, while *Neofabraea malicorticis* [the cause of North-Western apple anthracnose: *R.A.M.*, xi, p. 788] occurred on the native Oregon crab-apple (*Malus* [*Pyrus*] *rivularis*). The following plants were successfully inoculated with both fungi: peach, *A. alnifolia*, wild and cultivated cherry, plum, apricot, *P. rivularis*, flowering quince, hawthorn [*Crataegus*], mountain ash [*P. aucuparia*], and rose haws.

Dyes of the tri-phenyl-methane series inhibited spore germination at high dilutions. When malachite green [ibid., xi, p. 525] was incorporated into either potato-dextrose or Coons's synthetic agar at a concentration of 1 in 200,000, the growth of *N. malicorticis* was inhibited from 20 to 90 per cent. more than that of *G. perennans*.

HOCKEY (J. F.). **Gravenstein spot scald.**—*Scient. Agric.*, xiii, 4, pp. 225–227, 1 fig., 1932. [French summary on p. 274.]

A brief account is given of an injury resembling scald which in

1930 developed in a consignment of Gravenstein apples. The lesions appeared in apparently sound fruit after exposure in the shop windows, as circular, depressed, light brown spots centred around a darkened lenticel, and 1 to 10 mm. in diameter, but frequently coalescing to form irregular depressed areas 1·5 to 2 cm. in diameter. The epidermis and 4 to 8 layers of the hypodermal tissue were collapsed and brown.

Spotting more or less typical of this injury was experimentally reproduced in Gravenstein apples which were removed from cold storage and exposed to sunlight for one day, while apples that were kept in subdued light remained normal [cf. *R.A.M.*, xii, p. 179]. It is pointed out that the condition, which is termed 'spot scald', has only been seen on mature apples containing no starch in the pulp cells and practically no sucrose, and that temperature did not appear to have any great effect on its development. When tested for glutathion [ibid., x, p. 667] by White's method (*Science*, N.S., lxxi, pp. 74–76, 1930), before exposure to light, the apples showed a faint pink colour most concentrated immediately below the epidermis and adjoining the vascular bundles, while after exposure the test on sections containing spot-scalded areas gave a very pronounced pinkish-brown colour to the collapsed tissue, extending from immediately below the cuticle to a depth of six or eight layers of cells. This response to the glutathion test from the affected areas is believed to indicate that this or some other compound containing sulphur may be responsible for the trouble.

CHILDS (L.). **Observations on the increase of the Pear scab fungus.**—*Better Fruit*, xxvii, 6, pp. 5, 12, 1932.

Venturia pirina, while frequently serious in pear orchards west of the Cascade mountains in northern Oregon and Washington, was formerly only occasionally found in the more arid parts of southern Oregon and east of the Cascades. During the past three years, however, it has steadily become more widely prevalent in the Hood River Valley district of Oregon. The Anjou variety is the most susceptible, though occasional infections have been noted on Box and Bartlett.

Anjou pears are readily damaged by Bordeaux mixture and liquid lime-sulphur, and the only safe sprays on this variety were found to be dry-mix sulphur-lime, wettable, and atomic sulphur, which failed to control the disease. Good results were, however, obtained by ploughing in the fallen leaves, which was fully as effective as spraying.

Daily observations for two years showed that, even when only a little rain fell, spores were discharged from fallen leaves; with each shower from late February until September spores were liberated from old fallen leaves [see above, p. 296].

CHILDS (L.). **Observations on the ascospore discharge of Pear-scab fungus, Venturia pyrina.**—Abs. in *Phytopath.*, xxii, 12, p. 997, 1932.

Perithecia very similar to those of *V. pirina*, except in the apparent absence of setae, were observed in scabbed pear twig

lesions in Oregon and provisionally identified as those of *Mycosphaerella tulasnei*, the imperfect stage of which is a *Cladosporium* [*R.A.M.*, x, p. 194]. Both organisms discharge their ascospores only during rainy periods until at least as late as July [see preceding abstract]. In 1932 the first spores of *M. tulasnei* were liberated on 26th March. Wherever the latter fungus occurs on fallen leaves, scab perithecia are extremely rare or absent, even though scab lesions may be present.

HOUDAYER (C.). **Traitements d'automne et d'hiver des arbres fruitiers.** [Autumn and winter treatments of fruit trees.]—*Journ. d'Agric. Prat.*, xcvi, 52, pp. 524–526; 53, pp. 543–544, 1932.

Full directions are given for the dormant treatment of fruit trees against insect pests and fungous diseases in France [*R.A.M.*, xi, p. 655]. Shot hole of stone fruits (*Coryneum*) [*Clasterosporium carpophilum*] may be combated by an application in November of Bordeaux mixture (2 per cent. copper, 3 per cent. lime), followed by a winter treatment in fair, quiet weather, with Bordeaux-oil emulsion (2 kg. copper sulphate, 3 kg. hydrated lime, 8 l. anthracene oil, and 90 l. water). Knapsack sprayers with a 15 l. content, suitable for small orchards, should be worked at an initial pressure of 6 kg., decreasing to 3 kg.; with other types pressures of 12 to 4 kg. are practicable.

JOËSSEL (P. H.) & ANRÈS (M.). **Résultats des essais de traitement contre le Coryneum de l'Abricotier dans la région de Barroux (Vaucluse) au cours des années 1931 et 1932.** [Results of experiments on the control of the Apricot *Coryneum* in the region of Barroux (Vaucluse) in 1931 and 1932.]—*Rev. Path. Vég. et Ent. Agric.*, xix, 8–9–10, pp. 253–255, 1 pl., 1932.

In the valley of the Rhone apricot trees are stated to be seldom attacked during winter by *Coryneum* (*Clasterosporium carpophilum*) [see preceding abstract], but the fungus is important in that it frequently disfigures the fruit, the market price of which in 1932 was reduced in many cases from 450 or 500 frs. to 80 or 100 frs. per 100 kg. Good control of this disease and also of *Sclerotinia cinerea* [see next abstract] was obtained in 1931 and 1932 by spraying the trees with 2 per cent. Bordeaux or Burgundy mixtures, or with 0·5 per cent. neutral copper acetate spray. The last-named treatment, in particular, gave fruits that obtained in both years the highest price on the local market, owing to their exceptional quality.

ANRÈS (M.) & JOËSSEL (P. H.). **Observations sur l'apparition et le développement du Monilia de l'Abricotier en 1931 et 1932 dans les communes de Saint-Hyppolite, Caromb et Le Barroux (Vaucluse). Méthode de lutte employée et résultats obtenus.** [Notes on the appearance and development of the Apricot *Monilia* in 1931 and 1932 in the communes of Saint-Hyppolite, Caromb, and Le Barroux (Vaucluse). Results

obtained by the control methods used.]—*Rev. Path. Vég. et Ent. Agric.*, xix, 8–9–10, pp. 248–252, 1932.

Observations on the incidence and development in 1931 and 1932 of the *Monilia* (*Sclerotinia cinerea*) disease of apricot trees in three localities of Vaucluse [*R.A.M.*, xi, p. 791] showed that infection chiefly occurred on trees that blossomed during rainy and foggy periods, the first symptoms appearing eight or ten days after petal fall. No differences in the relative resistance of the varieties commonly grown were observed, and the fact that the Blanc-rosé variety was comparatively immune in both years was probably due to its flowering in fair-weather periods. The necessity of keeping the trees in a good sanitary condition and of pruning them properly was well demonstrated by the fact that neglected trees were badly diseased and did not respond to spraying with 2 per cent. Bordeaux mixture, which was fully effective on well-kept trees. The spraying schedule recommended is one application when the buds begin to burst, a second about the time of blossoming, and a third at the moment when the corolla drops off the young fruit.

Fischer (R.). **Versuche zur Bekämpfung der Blattranddürre der Johannis- und Stachelbeeren in Österreich.** [Experiments in the control of leaf scorch of Currants and Gooseberries in Austria.]—*Ernährung der Pflanze*, xxviii, 24, p. 440, 1932. [English summary on p. 456.]

Good control of leaf scorch in currant and gooseberry bushes [*R.A.M.*, xi, p. 463] was given in experiments during 1930–1 by the application to the soil of potassium sulphate at the rate of 150 gm. per sq. m. Even at 75 gm. per sq. m. the potash fertilizer effected a noticeable improvement in the state of the bushes, whereas those receiving smaller quantities or none developed the typical deficiency symptoms. A marked decline in susceptibility to the leaf fall due to *Pseudopeziza ribis* also followed the treatment.

Chabrolin (C.). **Contribution à l'étude des maladies des arbres fruitiers en Tunisie.** [A contribution to the study of fruit tree diseases in Tunis.]—*Ann. du Service Bot. et Agron. de Tunisie*, ix, pp. 177–200, 8 pl., 1932.

The following are the chief diseases of Tunisian fruit trees discussed in this paper. Oranges are liable to stem rot (*Polyporus* [*Fomes*] (?)*fulvus* [*R.A.M.*, ix, p. 188] and other Polyporaceae); root rot (*Armillariella* [*Armillaria*] *mellea*) [ibid., xi, p. 40]; gummosis (*Phytophthora citrophthora* and *P. parasitica*); shell bark (*Phomopsis californica*) [*Diaporthe citri*: ibid., xii, p. 213]; psorosis [ibid., xii, p. 89]; anthracnose (*Colletotrichum gloeosporioides*) [*Glomerella cingulata*]; blast (*Bacterium* [*Pseudomonas*] *syringae*) [ibid., xi, p. 249]; and various organisms infecting the fruit, of which *Penicillium digitatum* and *P. italicum* are the most common.

Date palms suffer from the 'medjnoon' or 'fool' disease caused by *Thielaviopsis* [*Ceratostomella*] *paradoxa* [ibid., xi, p. 572] and are also subject to infection by *Diplodia natalensis*, *Phomopsis*

phoenicicola, and 'dry bone' [loc. cit.]. Palm wine is prepared from the palms attacked by *Mauginiella scaettae* [ibid., x, p. 654] or otherwise prevented from yielding good dates.

El 'mal de Panama' enfermedad vascular de la planta del Platano. Legislacion Mexicana y extranjera sobre el Platano. [The 'Panama disease' a vascular disease of the Banana plant. Mexican and foreign legislation concerning the Banana.]—*Ofic. Def. Agric. Estados Unidos Mexicanos Bol. de Divulg.* 15, 56 pp., 9 col. pl., 4 figs., 1932.

At the beginning of 1928 symptoms of Panama disease (*Fusarium cubense*) [*F. oxysporum cubense*] developed in certain Mexican banana plantations, but not until the middle of 1931 was the causal organism identified by Wollenweber [*R.A.M.*, xi, p. 463].

The external and internal symptoms of the disease are described, with notes on predisposing conditions, varietal susceptibility, control, and legislation. Most of the varieties belonging to *Musa sapientum* have been found susceptible to Panama disease, including Gros Michel [cf. ibid., xii, p. 104], also known by various local names, e.g., Pouyat, Bluefield, and Tabasco, and the 'red' banana, while *M. Cavendishii* and its varieties 'white' and 'dwarf' are resistant. Experimental work on the development of resistant varieties with good commercial qualities is in progress. Discussing control measures, it is stated that the most suitable soil type for banana cultivation is composed as follows: clay 40 per cent., sand 52 per cent., humus 5 per cent., and lime 3 per cent. Directions are given for cultural operations, fertilizing, the destruction of infected rhizomes by gas-oil [ibid., xi, p. 585], and other means of combating the disease.

The Mexican and foreign legislation relating to Panama disease is summarized. Foreign quarantine No. 7 of 27th December, 1927, prohibiting the importation into Mexico of banana plants or any part thereof [ibid., vii, p. 416] was modified (30th May, 1928) to permit the entry of banana fruits for consumption into certain isolated districts in the northern region of Lower California, whence there is considered to be no risk of a spread of infection to the interior.

Mehrlich (F. P.). **Physiology and pathogenicity of species of Phytophthora that cause heart rot of Pineapple plants.**—Abs. in *Phytopath.*, xxii, 12, pp. 1001–1002, 1932.

Heart rot of pineapples in Hawaii is stated to be caused by *Phytophthora cinnamomi* [*R.A.M.*, xii, p. 106], *P. meadii*, *P. melongenae* [ibid., x, p. 740], and *P. parasitica* [ibid., xi, p. 625]. Newly-found hosts of these fungi include common weeds and green manures, which may enable them to persist in the absence of pineapples. Three of the above-mentioned organisms may also produce a rot of green pineapple fruits.

Mehrlich (F. P.). **The fungicidal control of Phytophthora rot of Pineapple plants.**—Abs. in *Phytopath.*, xxii, 12, p. 997, 1932.

In experiments in the control of the *Phytophthora* heart rot of

pineapple in Hawaii [see preceding abstract], Bordeaux 1-0·65–3 as a dip proved to be an effective and economical preventive, being superior to the other 21 liquid and 12 dry fungicides tested. A single dipping in eight separate trials gave an average of 79·23 per cent. control (63·40 to 91·59) under conditions highly favourable to the development of the disease, the amount of infection in the adjacent untreated plots ranging from 22·70 to 84·99 per cent. (average 48·8).

CARTER (W.). **Comparison of Tobacco dust with other forms of nicotine in control of yellow spot disease of Pineapples.**—*Journ. Econ. Entom.*, xxv, 5, pp. 1031–1035, 1 diag., 1933.

Compared with seven other forms of nicotine, tobacco dust (1·2 per cent.) proved definitely superior in the control of yellow spot of pineapples in Hawaii [*R.A.M.*, xi, p. 586]. The incidence of the disease was found to be correlated with the growth and succulence of the plants, yellow spot being less in the poorly growing areas of the field. The relatively slight incidence of the disease in the tobacco-dusted plots is thought to be due to the retardation of growth and toughening of the tissues resulting from the applications, rather than to any direct insecticidal effect on the vector, *Thrips tabaci*.

VAN POETEREN (N.). **Bestuiven en bestuivers.** [Dusting and dusting apparatus.]—*Versl. en Meded. Plantenziektenkundigen Dienst te Wageningen*, 67, 24 pp., 8 pl., 1932.

A brief account of the history of dusting for insecticidal and fungicidal purposes is followed by a discussion of the merits of this process as compared with spraying; notes on insecticidal, fungicidal, and combined dusts; the various types of apparatus in current use; the risks of injury to plants and the dangers to man and livestock arising from dusting; and the applicability of this form of treatment to various pests and diseases.

Under Dutch conditions dusting has generally been found less efficacious on the whole than spraying, but it often gives very satisfactory results and may be recommended as a supplementary treatment or even as a substitute for spraying where the latter operation is impracticable. The use of a good dusting machine, preferably of the motor type, is essential to success. The various methods of dusting and types of apparatus are clearly illustrated by 26 very good photographs. [This circular is also published in *Tijdschr. over Plantenziekten*, xxxviii, 11, pp. 229–252, 1932.]

HACHIYA (T.) & NISHIMURA (J.). **Action of some aromatic sulfur compounds upon pathogenic fungi.**—*Journ. Pharm. Soc. Japan*, lii, pp. 756–766, 1932. [English translation, pp. 89–91. Abs. in *Chem. Abstracts*, xxvii, 4, pp. 798–799, 1933.]

Potassium thiobenzoate possesses greater fungicidal activity than the sodium compound, and potassium β-thionaphthoate much greater. Urea exerts no positive action on pathogenic fungi [unspecified], thiourea being moderately active and phenylthiourea powerfully so. Among the aromatic sulphur compounds prepared, phenylthiourethan was the most active in this respect. Trypaflavin

was superior to phenylthiourethan, while mercuric chloride was almost equally effective with diphenylthiourea.

MARTIN (H.). **The present uses and future development of spray spreaders.**—*H[ortic.] E[ducational] A[ssoc.] Year Book*, i, pp. 76-84, 1932.

To avoid ambiguity the term 'spreader' should be restricted to those substances, such as soft soap, casein derivatives, gelatine, and (in less common use) resinates and saponin [*R.A.M.*, xii, p. 26], which serve to improve the wetting and spreading ability of spray fluids. Materials which improve spray retention, such as flour paste, dextrins, and gums, should be classed as 'stickers'. So-called spreaders may also function as protective colloids which, by delaying the sedimentation of spray suspensions, contribute to the even distribution of the toxic agent.

In this connexion, it is pointed out that soft soap added to Bordeaux mixture (10–10–100) at the rate of 5 to 10 lb. per 100 galls. is entirely converted to calcium soap; as the calcium soap is insoluble, the mixture completely lacks the wetting and spreading qualities of the soft soap solution. The calcium soap does, however, function as a sticker. Gelatine (1 in 100) acts as a sticker and a protective colloid, but the wetting and spreading qualities of the solution are poor. Not until the concentration of gelatine reaches at least 5 in 100 does the solution wet the conidiophores of the hop powdery mildew fungus [*Sphaerotheca humuli*] as readily as soft soap at a like concentration. Further, to act as a good wetter the solution must be fresh, while to act as a good sticker it must be kept until it attains high viscosity.

Notes are given on the chemistry and application of agrals [ibid., xi, pp. 679, 732], sapamines (obtained from the Society of Chemical Industry, Basle), sulphite lye [ibid., xi, p. 464], and by-products of oil refinement. The possibility of using oil sludge or of isolating suitable spreaders from it is worth investigation. A further line of possible development is the use of organic liquids in the form of spray emulsions, hydrocarbon and glyceride oils [loc. cit.] being possibly capable of extended use. The paper concludes with some practical notes on the use of spreaders.

TORNOW (ELISABETH). **Eine Schnellmethode zur Prüfung von Salben und Chemikalien auf Quecksilber.** [A rapid method for the examination of ointments and chemicals for mercury.] —*Angew. Chemie*, xlv, 45, pp. 707–708, 1932.

The writer describes the application of her method for the determination of mercury (based on the oxidation of aluminium in sodium thiosulphate) [*R.A.M.*, xi, p. 706; xii, p. 152] to a number of medicinal and cosmetic ointments and some standard liquid and dry seed-grain disinfectants.

Mercury was present in agfa [ibid., vii, p. 300], germisan (cyanmercuricresol), gerstenfusariol, roggenfusariol (mercuric chloride), sublimoform (mercuric chloride and formalin), weizenfusariol (mercuric chloride and copper sulphate), and uspulun-universal (an arsenical compound and chlorphenolmercury) among the liquid preparations tested, as well as in the following dusts: abavit B

(mercury iodide), betanal, ceresan, tillantin R, trockenfusariol, and tutan (mercury and copper). The following preparations were free from mercury: 'Saatbeize für Roggen' (copper sulphate and ferric sulphate), segetan-nassbeize (silver cyanide and copper oxide ammonia) [ibid., v, pp. 154, 540, *et passim*], hafertillantin, porzol (bismuth and copper) [ibid., v, p. 172], and tillantin (arsenic).

Schouten (A.). **Der Pflanzenschutzdienst in Holland und seine Organisation.** [The plant protection service in Holland and its organization.]—*Nachricht. über Schädlingsbekämpf.*, vii, 4, pp. 117–130, 6 figs., 1932.

An account is given of the organization and progress of the Dutch Plant Protection Service since its inception in 1899 [*R.A.M.*, x, p. 536]. The service functions through the head office at Wageningen and a number of provincial branches, the latter administered by technical officers posted throughout the chief growing and exporting districts of Holland, and concerned, *inter alia*, with such seasonal activities as bulb, potato, and gooseberry inspections. In 1930 the number of certificates issued with goods for export amounted to 141,314; 397,468 parcels of certificated bulbs for export weighing over 35 kg. were inspected, the corresponding figures for those from 10 to 15 and below 10 kg. being 79,320 and 258,540, respectively. The number of inspected consignments (large and small) of bulbs imported into Holland was 9,680 and of miscellaneous plants 41,306; inspections of fruit consignments for export totalled 2,980, of vegetables 557, of onions and shallots [*Allium ascalonicum*] 9,404, of potatoes 384,864,496 kg., and of gooseberries, 635,942 kg.

Lavroff (N. N.). Определитель растительных паразитов культурных и дикорастущих полезных растений Сибири. Выпуск I. Полевые, огородные, бахчевые, и технические культуры. [Key for the identification of vegetable parasites of cultivated and wild useful plants of Siberia. Part I. Field, kitchen garden, cucurbitaceous, and technically useful crops.]—140 pp., 91 figs., Publishing Office "Kouboutch", Tomsk, 1932.

This is a list, arranged in alphabetical order, of the common Russian names of the hosts, of the most important fungal and bacterial (and a few virus) diseases of cultivated crops, which have been so far recorded in Siberia. For each host a key is given for the identification of the diseases or pathogens, indicating the main external symptoms, and with brief notes on the parasites, some morphological details of which are also given in many cases. Special mention may be made of a virus disease of oats (a fuller description of which is given in Bondartzeff's text-book of Diseases of Cultivated Crops and their Control [*R.A.M.*, xii, p. 182]) which, according to V. S. Dontchenko, finds its expression in three different modifications of the host plant, namely, (*a*) general or partial viviparity, (*b*) stunting either by a shortening of the internodes or the production of fewer internodes, and (*c*) exaggerated tillering; these conditions were observed to occur in various combinations on the same plants. The disease is not transmissible by the seed, but is carried in the soil, and was observed to pass from

oats to wheat, barley, spring-sown rye, maize, proso (*Panicum miliaceum*), and soy-beans. It is distributed over the whole of Siberia from the Urals to the Pacific coast.

A powdery mildew of lentils, which the author distinguishes as a new biological form *ervi* of *Erysiphe communis* [*E. polygoni*], is characterized by conidia 27 to 37 by 13 to 18 μ in diameter, rounded, dark brown perithecia 108 to 135 μ, containing 7 to 10 asci measuring 48 to 54 by 23 to 36 μ, and ellipsoidal ascospores, 4 to 6 to each ascus, measuring 24 to 27 by 13·5 μ. A Russian description and Latin diagnosis are also given of a new species of *Puccinia*, which is named *P. hordeina* Lavroff n. sp., on barley. The uredosori are amphigenous, dispersed, minute, oblong, 320 to 720 by 110 to 160 μ; yellow to rusty-yellow; the uredospores are subglobose, echinulate, yellow, 16 to 27 by 16 to 22 μ, with 3 or 4 pores. The black, subepidermal teleutosori develop chiefly on the leaf sheaths, very rarely on the under side of the leaves; they frequently coalesce to form irregular lines up to 5 mm. in length; the teleutospores are oblong-clavate, two-celled, with a rounded or truncate apex, slightly constricted in the middle, brown, and 37 to 89 by 11 to 27 μ; the distal cell is of a darker colour, shorter, and thicker than the basal which terminates in a short, detachable pedicel. The paraphyses are brownish. Mesospores are also present in small numbers, and are smaller than the teleutospores. This rust was only found in western Siberia and in the Altai foothills.

Palm (B. T.). **Algae as additional hosts of pathogens to angiosperms (preliminary note).**—*Zentralbl. für Bakt.*, Ab. 2, lxxxvii, 9–12, pp. 229–233, 1932.

In support of his view that the lichen fungi are parasites on the algal hosts, on which they form sclerotia or stromata, the writer cites experiments establishing the parasitism of *Rosellinia necatrix* and *Pythium mamillatum* [*R.A.M.*, x, p. 487] on various algae.

Small quantities of aerial mycelium of *R. necatrix* from a fresh subculture were applied to vigorously growing mats of *Vaucheria* and *Hydrodictyon* spp. in Petri dishes, the former with and the latter without adhering soil. The fungus made extensive growth on the *Vaucheria*, penetrating the algal filaments and destroying the chlorophyll in the protoplast, where products of fatty degeneration were perceptible. The *Hydrodictyon* was similarly but less extensively penetrated by the fungus, which further parasitized a species of *Cladophora*. Inoculation experiments on *Vaucheria*, *Cladophora*, and several Chlorophyceae and Cyanophyceae showed that *Gibberella saubinetii* (*Fusarium* stage) [*F. graminearum*], *Cylindrocarpon mali* [*Nectria galligena*: cf. ibid., vii, p. 677], and other fungi can act as parasites on one or more of the above-mentioned algae.

A similar experiment with *Pythium mamillatum* on *Cladophora* and *Gloeocapsa* spp. in Petri dishes and hanging drops also resulted in the partial or total disorganization of the host cells, a few of which were found to contain the oospores of the fungus; these were mostly formed, however, outside the host.

Fischer-Piette (E.), Heim (R.), & Lami (R.). **Note préliminaire sur une maladie bactérienne des Zostères.** [Preliminary note on a bacterial disease of the *Zosterae*.]—*Comptes rendus Acad. des Sciences*, cxcv, 26, pp. 1420–1422, 1932.

During the winter of 1931–2 the vast tracts of the grass-wrack seaweed (*Zostera marina*) in the Saint-Malo region (Brittany) were suddenly destroyed by a bacterial disease, which is stated to have been also reported on the same host in other parts of the French Atlantic coast and from Holland, Canada, and the United States (whence it is thought to have been introduced into Europe). After a partial recovery during the summer of 1932, the plants began to show signs of the same trouble in November. Considerable importance attaches to the disease owing to the many economic uses of the host, e.g., for manure, stuffing, packing, and the like.

The first symptom is the appearance of grey to brownish spots at the apex of the leaves, converging and extending downwards to the sheaths and rhizomes, on which the spots are brown or black. Ultimately the branches become entirely blackened and torn and decayed rhizomes are readily broken.

Bacteria were observed in the diseased leaves and also in the vascular bundles, the sclerotic fibres, and in spaces left between the cells by the dissolution of the middle lamella. They were isolated in pure culture and found to be rod-shaped, Gram-negative, and to measure 1·5 to 4 by 0·5 μ. Further studies are in progress.

Beauverie (Marie A.). **Les maladies à ultravirus des plantes.** [The ultra-virus diseases of plants.]—*Ann. du Service Bot. et Agron. de Tunisie*, ix, pp. i–ii, 1–175, 8 pl., 1932.

In this comprehensive survey of the virus diseases of plants in the light of contemporary research, the writer discusses the subject under the following aspects: (1) characteristics of the virus diseases as a group apart from those due to bacteria, fungi, and other agents, or to ecological factors; (2) technique of preparation and examination of the sap extracts of affected plants; (3) nature of the causal agent of virus diseases (considerations on the bacterial, protozoan, enzymatic, and filterable or ultra-virus theories); (4) difference between infectious and non-infectious chloroses; (5) pathological histology and cytology of diseased plants; (6) natural and artificial transmission of virus diseases; (7) a study of some virus diseases attacking economic plants; (8) analysis and synthesis of the viruses; (9) relationships between the virus diseases of plants and of animals.

Each section is followed by a list of authors, with the number under which their papers appear in the supplementary bibliography of the relevant literature, comprising 762 titles.

Ferguson (J. H.). **The particle size of biological units. A review.**—*Journ. Physical Chem.*, xxxvi, 12, pp. 2849–2861, 1932.

A review is given of the literature concerning the particle size of the biological units of the filterable viruses, the bacteriophage of the Twort-d'Hérelle phenomenon, and the genes constituting the ultimate physical units of heredity. The data thus assembled are considered to afford a very slender foundation for definite con-

clusions as to the nature of the units in question. Generally speaking, these units are rather too large to reconcile with the physico-chemical facts regarding the largest known or suspected molecules. The lowest estimate of bacteriophage size (5 mμ) approximates to Svedberg's values for the haemoglobin molecule (Colloid Chemistry, 2nd Ed., 1928); an average figure of 50 mμ in diameter for biological entities means a volume of a thousand times as great, with room for many hundreds of protein molecules. One of the current conceptions of the basis of life is that of a self-perpetuating catalyst of molecular (? protein) size. Such speculations are, however, considered to be fruitless until the entities under discussion are definitely established by physico-chemical data on the one hand, while on the other the biologist recognizes their 'vital' powers of reproduction, assimilation, and adaptation [cf. *R.A.M.*, xi, pp. 734, 751].

A table is given showing the estimated particle size of the biological units of various human and animal virus diseases and tobacco mosaic (30 mμ) [cf. ibid., xi, p. 735], with the authority, date, method of calculation, and a suitable object of comparison in each case. A bibliography of 83 titles is appended.

PEYRONEL (B.). **Absence de mycorhizes chez les plantes insectivores et hémiparasites, et signification probable de la mycorhizie.** [Absence of mycorrhiza on insectivorous and hemiparasitic plants and probable significance of the mycorrhizal relationship.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, iv, 11, pp. 483–486, 1932.

After suggesting that if mycorrhizal fungi are parasitic then they should be found as readily on the roots of insectivorous and hemiparasitic plants as on those of other plants in the same locality, the author states that *Drosera rotundifolia* and *Pinguicula vulgaris* growing in damp situations showed no trace of mycorrhiza, though *Viola palustris*, *Potentilla tormentilla*, and various grasses in the immediate vicinity were markedly affected. Similarly, no mycorrhiza was found on the hemiparasites *Euphrasia officinalis*, *E. minima*, *Rhinanthus major*, *Melampyrum pratense*, *Odontites serotina* [*Bartsia odontites*], and *Thesium alpinum*, all of which except *B. odontites* grow in the fields or woods in the Piedmontese mountains; *B. odontites* was growing in rye fields where the rye and various wild grasses showed the abundant presence of mycorrhizal fungi. Typical endotrophic mycorrhiza of the *Endogone* or phycomycetoidal type [*R.A.M.*, iv, p. 755] were observed on the non-parasitic Scrophulariaceae, *Veronica officinalis*, *V. allionii*, *V. fruticulosa*, *V. chamaedrys*, *V. urticifolia* [*V. praecox*], *Linaria vulgaris*, and *Digitalis ambigua* growing in the same stations. The holo-autotrophic plants examined by the author, invariably, and the hemiparasitic ones frequently, showed the presence of the mycelium of a weakly parasitic *Rhizoctonia*. Plants of *Euphrasia* growing in damp places near ditches frequently showed a Chytridiacean fungus, differing in some respects from *Asterocystis radicis*, in the epidermal cells of the roots [ibid., iii, p. 539].

The author considers that these observations support the view that mycorrhizal formation is related to nitrogenous food supply.

From the information at present available it appears that the mycorrhizal relationship has its greatest development in soils poor in soluble nitrogenous material (nitrates and ammoniacal salts), but rich in organic matter. Plants growing in cultivated land are those which least frequently show mycorrhiza; the author's own experience demonstrated that if wheat is sown in meadow land or pasture its roots are completely invaded by mycorrhizal fungi, but that if it is sown in soil to which fertilizers (such as nitrate of soda or lime) have been added, very few of the roots have any mycorrhiza.

FRASER (LILIAN). **An investigation of Lobelia gibbosa and Lobelia dentata. I. Mycorrhiza, latex system and general biology.** —*Proc. Linn. Soc. New South Wales*, lvi, 5, pp. 497–525, 44 figs., 1 graph, 1931.

A comprehensive account is given of the writer's investigations (incorporating the earlier researches of Miss A. Rennie) on the mycorrhiza, latex system, and general biology of *Lobelia gibbosa* and *L. dentata* in New South Wales and South Australia.

The mycorrhiza of the laticiferous plants under observation is of an unusual type. The minute seeds germinate at a considerable depth below the soil and are obliged to rely on the fungus for their nutrition in the early stages of growth, during which they are regarded as holoparasites on the fungus, as they have no root hairs and no leaves. Strands of fungal hyphae resembling rhizomorphs are invariably found associated with the hypocotyl region of young seedlings, spreading out to form a mat over the surface and in places penetrating the cortex by growing down between the cells, especially of the outer layers, which are almost completely surrounded by the hyphae. The hyphae composing the outer part of the fungal mat are narrow, thick-walled, closely septate, and interwoven, while the inner ones and those invading the root are greatly enlarged, thin-walled, and densely protoplasmic. The strictly intercellular fungus evidently infects the young primary root as soon as the latter commences growth, keeping pace with its development and also penetrating all the lateral roots and their branches. It is found in all the cell layers of the cortex, the cells of the infected regions being markedly enlarged transversely. Except in places where branching occurred, only one point of entry into the root could be found for any one fungus strand, so that penetration is evidently effected by a modification of the growing point of the rhizomorph.

Three stages can be distinguished in the association of the mycorrhizal fungus and the *Lobelia* root cells. (1) The period of fungal invasion, when the slender, densely protoplasmic hyphae may be seen growing down between the cortical cells. (2) The period of fungal enlargement in the middle cortex, during which an accumulation of oil drops takes place in the fungal cells and those of the cortex are forced apart. (3) The period of fungal depletion from the inner cortical zone outwards, characterized by the disappearance of all reserve food from the hyphae and the

aggregation in the peripheral cytoplasm of the adjacent cells of numerous minute drops of reserve food giving the reactions of an oil or fat. During this process the outer cortical cells gradually expand and practically crush the fungus, only a few living hyphae of which remain in the external layers. Food material is evidently extracted from the cortical cells by the fungus and vice versa by osmosis, since no trace of haustoria could be detected.

Attention is drawn to the difference between the *Lobelia* mycorrhiza and the ectotrophic type, in which the mycelium forms a thick mat over the root surface and penetrates it at all points. The organism under discussion also differs from the endotrophic type producing arbuscules [see next abstract] which are digested by the cells they invade, and from the orchid mycorrhiza with its exclusively intracellular hyphae serving as nutriment to the higher plant [*R.A.M.*, xi, p. 317].

McLuckie (J.) & Burges (A.). **Mycotrophism in the Rutaceae. I. The mycorrhiza of Eriostemon crowei F. v. M.**—*Proc. Linn. Soc. New South Wales*, lvii, 5–6, pp. 291–312, 22 figs., 1932.

After stating that the authors have detected endotrophic mycorrhiza in *Zieria smithii*, *Eriostemon crowei*, *E. lanceolatus*, and in the genera *Boronia* and *Correa*, of the Rutaceae (a family with which the mycotrophic habit had not been hitherto associated), details are given of the cytological examination of the mycorrhiza of *E. crowei*, with which those in the other species studied are stated to be in close agreement. The roots are infected by two different fungi, the first of which forms a network of branched, septate, brown hyphae with thick walls and scanty cell contents, on the surface of the root, adhering to the epidermal cells. These hyphae develop swellings resembling appressoria, from which the infecting hyphae arise. Entry of the latter is readily effected through the epidermis, in the cells of which they frequently form coiled masses of thin-walled, non-septate hyphae with sparse contents. In the cortex the fungus advances both transversely and longitudinally, chiefly along the intercellular spaces. The cortical hyphae are irregular, thin-walled, with occasional septa, an abundant granular cytoplasm, numerous nuclei and fat masses, and they send branches into the cells to form arbuscules, both simple and complex, and, later, groups of sporangioles. The latter are not confined to any particular region of the cortex, but occur in all cell-layers between the epidermis and endodermis. The fats, which stain with osmic acid, at first are distributed in the hyphae, in the arbuscules, and in the developing sporangioles, but ultimately accumulate in the last-named organs (which appear to be formed by a swelling of the ends of the branches of the arbuscules), and are later liberated by bursting of the sporangioles into the host cell cavity, sometimes forming several very large, apparently homogeneous globules. Still later the fat globules no longer stain with osmic acid, indicating that they have changed in composition, and finally they disappear, being probably used by the host. Large fat globules also occur in uninfected cells of the epidermis.

All these processes were observed in very small seedlings, as well as in mature plants in full flower and fruit, unlike McLennan's observations of the mycorrhizal endophyte of *Lolium* [*R.A.M.*, v, p. 379], in which the disappearance of the fats was correlated in time with the flowering and fruiting period of the host. Apart from this, however, there is a striking parallelism between these two endophytes in their relation to the higher plant. Vesicles are also developed by the endophyte, chiefly in the intercellular spaces of the outer cortex, but occasionally within a cortical cell; they are usually terminal, occasionally intercalary or lateral, average 68 by 53 μ in diameter, and contain a large amount of cytoplasm, numerous fat masses, and nuclei. Later they develop a thick wall, become vacuolated, and finally lose all their contents to the vegetative hyphae or the sporangioles. No suggestion of spore formation within them was given and the resemblance to *Endogone* emphasized by Peyronel [see preceding abstracts] is confirmed by the authors. Eventually the remnants of the sporangioles and hyphae inside the host tissues are reduced to a structureless or occasionally reticulate residuum which remains in the cell. After liberation of the fat from the sporangioles, the host nucleus increases in volume and shows marked chromatic increase but no structural hypertrophy. It is suggested that in the early stages of the association the fungus is parasitic, but that later the host plant gets the upper hand.

The second endophyte, which is a *Rhizoctonia* form with moniliform hyphae and no vesicles or arbuscules, occurs in the epidermis and cortex of the roots; this form was isolated from the roots, while the arbuscule-forming fungus has not yet been isolated. It appears to be very like the *Rhizoctonia* isolated by Peyronel from wheat [ibid., iii, pp. 291, 539].

KREBBER (O.). **Untersuchungen über die Wurzelknöllchen der Erle.** [Investigations on the root nodules of the Alder.]—*Arch. für Mikrobiol.*, iii, 5, pp. 588–608, 2 figs., 1932.

The writer's laboratory and field investigations here recorded were carried out at Münster, Westphalia, and were directed to determine the nature and functions of the root nodules of alder (*Alnus glutinosa* and *A. incana*) [*R.A.M.*, x, p. 476]. They confirmed Hiltner's observations (*Landw. Versuchsstat.*, xlvi, p. 153, 1896; *Naturw. Zeitschr. Land. u. Forstw.*, i, p. 17, 1903; ii, p. 336, 1904, the last paper with F. Nobbe) that the relationship between the host and the endophyte is symbiotic, the latter assisting the assimilation of molecular nitrogen by the trees.

The endophyte was found to be a unicellular organism with slender, finely granular hyphae, which form a tangle in the infected cells and develop 'vesicles' at their apices. In the later stages of the partnership the endophyte seems to be almost entirely absorbed by the host cells.

Cytological observations indicate that the endophyte which causes the nodules is a species of *Actinomyces*, but all attempts to obtain it in pure culture gave negative results.

DICKSON (J. G.). **Studying the effect of environment upon the development of parasitic diseases and selecting for disease resistance presents problems in co-operation in research.**—*Scient. Agric.*, xiii, 4, pp. 213–224, 5 figs., 1932. [French summary on p. 273.]

The author states that recent attainments in the study of the bearing of environmental factors on the constitution of plants and on their reaction to parasitic diseases, as well as in breeding plants for resistance to diseases, distinctly point to the necessity of such work being carried out in close co-operation between plant biologists, physiologists, and chemists. By way of illustration he gives a progress report on the results obtained in such co-ordinated investigation of the interrelation existing between controlled environmental conditions and the susceptibility of wheat and maize to seedling blight (*Gibberella saubinetii*) [*R.A.M.*, vii, p. 777; xi, p. 171].

SILBERSCHMIDT (K.). **Studien zum Nachweis von Antikörpern in Pflanzen II. Teil B. (Beiträge zur Frage der Resistenz und Immunität von Pflanzen gegenüber dem infizierenden Agens der Viruskrankheiten).** [Studies on the detection of antibodies in plants. II. Part B. (Contributions to the problem of resistance and immunity in plants in relation to the infective principle of the virus diseases).]—*Beitr. Biol. der Pflanzen*, xx, 2, pp. 105–178, 1932.

A comprehensive and fully tabulated account is given of the author's studies on the occurrence in tobacco plants of antibodies conferring immunity from mosaic [cf. *R.A.M.*, x, pp. 563, 689], preceded by a survey of the relevant literature.

The first point to be decided was whether natural resistance to tobacco mosaic actually exists in certain plants to the extent assumed by some investigators; in this connexion it was necessary to determine, by serological methods, the occurrence of antibodies in the resistant partner of a graft between a mosaic stock and healthy scion [cf. ibid., x, p. 539]. Experiments were further carried out on the active and passive immunization of tobacco plants against the mosaic virus [cf. ibid., xii, p. 43].

The tobacco plants used in the tests all belonged to a pure line of the Maryland Broadleaf variety. The seeds were germinated in dishes on damp filter paper; after a few days the seedlings were transferred to small clay saucers containing finely sifted soil, whence they were subsequently removed to wooden frames with glass lids, the sides being covered with gauze to exclude insects.

As a rule the inoculations were made by gently rubbing a drop (0·03 c.c.) of the virus from a sterilized pipette on a leaf of the test plant. The virulence of the extract was mostly estimated by Holmes's method on *Nicotiana glutinosa* seedlings [ibid., viii, p. 138]. The infective principle originated in a mosaic tobacco plant from the Bavarian Institute of Agriculture and Plant Protection. It produces on tobacco the typical mosaic symptoms as described by Allard (*U.S. Dept. of Agric. Bull.* 40, 1914) and causes a slight leaf spotting and curling of the pinnae in tomatoes and local necroses on *N. glutinosa* and *Datura stramonium* leaves;

on the other hand, *Atropa belladonna*, *Phytolacca decandra*, and *Lycium barbarum* failed to react to inoculation with the virus, which evidently corresponds to Johnson's 'tobacco virus 1' [*R.A.M.*, vi, p. 501].

The mosaic virus was detected sporadically in scions of *L. barbarum*, *A. belladonna*, and tomato grafted on mosaic tobacco, as shown by the more or less extensive necroses produced by the expressed sap of these scions on *N. glutinosa*. The tomato sap was the most virulent, indicating that the tobacco mosaic virus from the stock had not only penetrated the scion but multiplied in it. Serological experiments showed that the sap from scions of *L. barbarum* grafted for two months on mosaic tobacco stocks contained no antibodies, the presence of which would have been reflected in a heightened precipitin content. When the leaves of healthy *N. glutinosa* plants are rubbed, before inoculation with the mosaic virus, with anti-virus serum (obtained from inoculated animals), the number of necroses is considerably reduced, a similar but less pronounced effect following the application of serum after inoculation. This phenomenon, however, appears to be attributable rather to the protective action of serum in general than to any specific property of the anti-virus serum, since it was impossible to induce passive immunization of healthy tobacco plants by inoculation with a mixture of the virus and serum. Negative results were also given by attempts at the active immunization of tobacco plants by inoculation with dilute solutions of the virus.

When mixtures of virus and anti-virus serum were prepared in test tubes, the supernatant liquid above the precipitate was not virulent unless the mixture contained an excess of virus. In mixtures of the mosaic virus and active anti-virus serum even the precipitate loses its virulence partly or wholly. The behaviour of the anti-virus serum towards the expressed sap of mosaic plants *in vitro* is considered to support the conception of the organic nature of the infective principle [cf. ibid., xi, p. 734 *et passim*].

WILLE (F.). **Puffergrösse und Auftreten von Pflanzenkrankheiten.** [Buffer content and occurrence of plant diseases.]—*Zentralbl. für Bakt.*, Ab. 2, lxxxvii, 13–16, pp. 301–331, 1933.

This is an expanded account of the writer's studies in Valais, Switzerland, on the part played by the buffer content in determining the reaction of certain vines, conifers, and deciduous trees, to various fungous diseases, as well as to smoke and gas injury, a preliminary note on which has already appeared [*R.A.M.*, ix, p. 48]. The parasitic fungi mentioned are *Plasmopara* [*viticola*] and *Pseudopeziza* [*tracheiphila*] on the vines, *Lophodermium* and *Hypodermella* on the conifers [ibid., xii, p. 254], *Gnomonia erythrostoma* and *Clasterosporium carpophilum* on *Prunus avium*, and *C. carpophilum* and *Polystigma rubrum* on *P. domestica* [ibid., xi, p. 660].

SCHAFFNIT (E.) & LÜDTKE (M.). **Über die Bildung von Toxinen durch verschiedene Pflanzenparasiten.** [On the formation of toxins by various plant parasites.]—*Ber. Deutsch. Bot. Gesellsch.*, l, 9, pp. 444–463, 2 figs., 1932.

An account is given of the writers' investigations on the

chemical nature and effects of the toxins secreted by *Ophiobolus graminis*, *Fusarium vasinfectum*, *F. lycopersici*, and *Didymella lycopersici*.

The germination of wheat seed-grain was arrested or prevented by the toxins secreted by cultures of *O. graminis* on mixed wheat, barley, and oat grain. The toxic principle in the filtrate was not inactivated by distillation in an oil bath in which the temperature rose to 125° C. Germination tests showed that the toxins scarcely pass into the distillate, the adverse effect on growth being practically confined to the residue. The filtrate of the fungus on a medium of ground wheat grain produced no toxic effect on germination even after 4½ months. Wilting was produced in cut tomato shoots placed in an aqueous extract of mixed grain on which *O. graminis* had grown as indicated above, but not in one of ground wheat.

Cotton and tomato plants were injured or killed by the filtrates of cultures of *F. vasinfectum* and *F. lycopersici*, respectively, on Richards's solution, the optimum temperature for the development of the former on which was found to be 24° to 28° C. Wilting of cotton began after 28 hours in the filtrate of a week-old culture of *F. vasinfectum*, the corresponding period for tomato in the *F. lycopersici* filtrate being 24 hours; at and after five weeks old the culture filtrates were capable of destroying the plants in a few hours (seven at the most). The P_H value of the culture fluid at five weeks had risen from an initial of 4·02 to 7·41 in the case of *F. vasinfectum* and to 7·84 in that of *F. lycopersici*. The toxic principle, as in the case of *O. graminis*, was found to be virtually restricted to the residue on distillation. Lathrop's assumption that the presence in the filtrate of propionaldehyde is the cause of wilting (*Phytopath.*, vii, p. 14, 1917) could not be verified by the writers.

A strongly toxic action was exerted on the test plants by the extract from centrifuged ground hyphae of *F. vasinfectum*, indicating that the poison is an organic substance residing in and excreted by the fungus, and not a product of the nitrites or other salts of the culture liquid, as suggested by H. R. Rosen [*R.A.M.*, xi, p. 513]. Not only cut tomato plants but those with intact roots, contrary to Bewley's observations [ibid., ii, p. 149], were wilted by a 0·5 per cent. solution of the toxin, which lost none of its virulence by 20 minutes' boiling. In all probability the toxic substance is an amine or combination of amines. Both the culture filtrate and the mycelial extract of *F. vasinfectum* caused wilting of clover, peas, chrysanthemum, cotton, beans [*Phaseolus vulgaris*], and wheat in addition to tomato. Cotton, pea, and wheat seeds laid (after sterilization and washing) between sheets of blotting-paper moistened with the toxic solution suffered retardation of germination. The diaminoacids, e.g., d-lysin and d-arginin, in 0·5 per cent. solutions, were found to cause severe wilting of tomato plants in 48 hours, while the same concentration of asparagin, colamin, diethylamin, and allylamin (especially the last-named) reduced the germination of wheat.

Cut tomato plants were severely wilted by a 2·5 per cent. solution of the residue from the culture filtrate of *D. lycopersici* after

treatment with methyl alcohol [ibid., xi, p. 809], as well as by the mycelial extract, but not by the distillate. Here again the toxic principle evidently resides in the organism itself, presumably in the form of amines or amino acids. *F. vasinfectum*, *F. lycopersici*, and *D. lycopersici* differ in this respect from *O. graminis*, the toxins developing during the growth of which in culture appear to be the metabolic products of the nitrogenous elements in the medium, rather than substances in the fungus itself.

Hansen (H. N.) & Smith (R. E.). **The mechanism of variation in imperfect fungi: Botrytis cinerea.**—*Phytopath.*, xxii, 12, pp. 953–964, 3 figs., 1 diag., 1932.

This is an expanded account of the writers' studies on the mechanism of variation in single-spore isolations of 47 cultures of *Botrytis cinerea* collected from different plants in California, a brief note on which has already appeared [*R.A.M.*, xi, p. 477]. It is stated that while the perfect stage of any of the fungi referred to *B. cinerea* does not seem to have been recorded in America, Whetzel has informed the authors that he has confirmed the connexion between the European grape *Botrytis* and *Sclerotinia fuckeliana* [ibid., viii, p. 607].

The hyphal cells and conidia of the fungus were found to be multinucleate, and hyphal anastomosis is very common. It is suggested that by the mechanism of anastomosis nuclei of one strain may migrate into the cells of other strains, thereby giving rise to cells and spores containing two or more kinds of genetically different nuclei. On the assumption that the basic unit of the individual is the nucleus and not the cell, it is further suggested that a multinuclear spore is not an individual but a colony, which cannot produce a genetically pure culture unless all its nuclei are genetically identical.

It is suggested that variable forms of the Fungi Imperfecti may owe their instability, not to mutation, but to nuclear heterogeneity (heterocaryosis), a condition that may be induced both *in vivo* and *in vitro* by the nuclei of one strain entering the cells of another strain through anastomoses.

Bailey (Alice A.). **Effects of ultraviolet radiation upon representative species of Fusarium.**—*Bot. Gaz.*, xliv, 2, pp. 225–271, 1 pl., 4 figs., 2 graphs, 1932.

A comprehensive and fully tabulated account is given of the author's comparative study of the effects of irradiation (mostly with a Cooper-Hewitt quartz mercury-arc lamp, operated on alternating current at 4 amperes through resistance from a 110-volt line) on sporulation and certain physiological attributes, e.g., colour production and growth rate, in representative species of *Fusarium* [*R.A.M.*, ix, p. 400].

In most of the 59 species, varieties, and forms exposed to the ultra-violet rays through filters transmitting waves as low as 2,650 but not lower than 2,300 Ångström units there was an increase in total sporulation, sometimes accompanied by pigmentation in the mycelium. A very marked increase in macrospore

percentage followed three daily 15-minute treatments under vita-glass (transmitting to 2,650 Ångström units) in *F. neoceras, F. cepae* [ibid., xii, p. 135], *F. solani* var. *medium, F. sporotrichioides, F. vasinfectum* var. *zonatum* and forms 1 and 2, *F. bulbigenum* [ibid., x, p. 795], and *F. redolens* [ibid., viii, p. 520]. On the other hand, *F. conglutinans, F. bulbigenum* form 1, *F. moniliforme* (*Gibberella moniliformis*) and its varieties, *F. orthoceras, F. oxysporum*, and others showed little or no increase of sporulation as a result of irradiation. All the species responding to the treatment, except *F. oxysporum* var. *nicotianae* (the pathogenicity of which was not tested), were saprophytes or decay producers, the vascular parasites giving no appreciable reaction to the rays.

In *F. culmorum* the treated plates showed up to 83 per cent. macrospores at a time when they were completely absent from the controls; this increase was maintained even after the latter began to sporulate. Conidial production was further stimulated by irradiation in a strain of *F. coeruleum* that had not hitherto sporulated, as well as one of *F. sambucinum* [ibid., vi, p. 624], the activity of which was in abeyance. One strain of *Fusarium* (section *Gibbosum*) from decayed onion bulbs, that had never sporulated in the laboratory, produced 75 per cent. macrospores under irradiation.

F. vasinfectum var. *zonatum* and *F. semitectum* [ibid., xii, p. 39] yielded the maximum amount of macrospores under Corex filter 980 A, transmitting to 2,300 Ångström units, the corresponding peak with *F. sporotrichioides* and *F. bulbigenum* occurring under Corex 986 A between 2,535 and 4,340 Ångström units. A distance of 40 cm. from the arc proved best for the purposes of these tests. Direct exposure at 2,230 Ångström units resulted in a decreased growth rate and other injurious effects varying according to the species. *F. argillaceum* usually produced many chlamydospores on irradiation. In some species, e.g., *F. vasinfectum* var. *zonatum*, the macrospore content reached a peak 48 hours after the cessation of irradiation, whereas in others, *F. bulbigenum* for instance, the maximum occurred 24 hours after the third exposure.

None of the 14 species of *Fusarium* with known perfect stages used in the experiments produced perithecia on irradiation except two plates of *F. javanicum* [ibid., xii, p. 197] var. *theobromae*.

SCHMIDT (E. W.). **Über eine pathologische Fettbildung in Zuckerrübenblatt.** [On a pathological fat formation in the Sugar Beet leaf.]—*Ber. Deutsch. Bot. Gesellsch.*, 1, 9, pp. 472–474, 1 fig., 1932.

Attention is drawn to the formation, in the cells of sugar beet leaves infected by *Uromyces betae* [*R.A.M.*, xi, p. 91], of accumulations of fat drops round the uredosori. The phenomenon may be conveniently studied in sections stained with Sudan red and treated with sulphuric acid, and its occurrence may be regarded as diagnostic of beet rust. There were indications of a similar aggregation of fat drops in wheat leaves artificially inoculated with *Puccinia glumarum*.

CRAIGIE (J. H.). **Union of pycniospores and haploid hyphae in Puccinia helianthi Schw.**—*Nature*, cxxxi, 3297, p. 25, 1 fig., 1933.

The examination of freehand sections of monosporidial pustules of *Puccinia graminis* and *P. helianthi* [*R.A.M.*, xii, p. 235] usually revealed two types of hyphae protruding through the pycnidial ostioles, viz., (1) the ordinary stiff, tapering, slightly curved paraphyses, and (2) flexuous hyphae showing considerable variations in dimensions, shape, and other features. In some of the pycnidia (probably the older ones) of a pustule, these hyphae may be profusely developed, whereas in others they are almost or entirely absent. They are generally as long as the paraphyses, sometimes two or three times as long, and seldom shorter. Branching may occur but septation is rare. Some of the flexuous hyphae have swollen tips, from the side of which a short spur or peg occasionally protrudes. The latter is believed to act as a means of contact between a hypha of one sex and a pycnospore of the opposite sex, several cases of fusion between which were observed in sections of haploid pustules of *P. helianthi* with the nectar so intermixed that both (+) and (−) pycnospores were present on the surface of each pustule and in close proximity to the protruding hyphae. Empty pycnospores found connected by short tubes to these hyphae furnish strong circumstantial evidence that nuclei migrate to them from pycnospores by means of fusion tubes. This type of union simulates that between oidium and hypha in the Hymenomycetes [cf. ibid., xii, p. 186].

VAN DER MEER (JIKKE H. H.). **A study of the virus from the apparently healthy Potato variety 'Green Mountain'.**—*Zentralbl. für Bakt.*, Ab. 2, lxxxvii, 9–12, pp. 240–262, 11 figs., 1932.

The writer's greenhouse experiments at Wageningen, Holland, in 1930 and 1931, showed that the apparently healthy Green Mountain potato variety is the carrier of a virus producing pathological symptoms varying according to the host and the stage of development of the foliage [cf. *R.A.M.*, xii, p. 48].

Two chilli (*Capsicum annuum*) varieties reacted to inoculation with Green Mountain leaf or tuber juice by necrosis, which in some cases resembled the top necrosis or acronecrosis produced when Paul Kruger [President] potatoes were grafted with apparently healthy Green Mountain by Quanjer and Botjes [ibid., ix, p. 482; x, p. 746]; *Datura stramonium*, tomato, tobacco, and *Hyoscyamus niger* reacted by distinct mosaic; and *Physalis alkekengi* and *Solanum nodiflorum* by mild mosaic [ibid., v, p. 119]. No symptoms developed in inoculated plants of *S. dulcamara*, *S. capsicastrum*, *Atropa belladonna*, and *Cyphomandra betacea*.

The oldest reacting leaves of *D. stramonium*, tomato, tobacco, and *H. niger* were characterized by clearing of the veins, the younger by veinbanding, the later developing foliage of *D. stramonium*, tomato, and *H. niger* by irregular yellow areas, and that of tobacco by ring spot. The older leaves showed these symptoms at the base and the younger towards the tip. Once established, the symptoms were irreversible. The passage of water in diseased *D.*

stramonium plants was found to be slower and less regular than in normal ones.

D. stramonium serves as a useful indicator in experiments with the Green Mountain virus, to which it reacts rapidly and distinctly. The various symptoms manifested by this host, viz., clearing of the veins, veinbanding, and yellow areas, were all found to be due to the same virus. At least three days are requisite for the transference of the virus from the infected leaf to the stem. The viability of the virus *in vitro* is at least 18 days. It is inactivated by ten minutes' heating of the juice at 75° C. and by admixture with 64 per cent. alcohol (but not with 50 per cent.). The incubation period is protracted by dilution of the juice, a noticeable delay occurring after a dilution of 1 to 100; only one out of twelve plants became diseased on inoculation with the virus diluted 1 to 100,000, and the incubation period was doubled.

In many respects the Green Mountain virus agrees with Johnson's virus 5, which produces ring spot on tobacco, but apparently no symptoms on potato [ibid., vi, p. 501], though it does not seem to be quite identical, especially in its more severe effects on *Capsicum*.

Tuber inoculations on President showed that a number of other potato varieties carry the same virus as Green Mountain, e.g., Magdeburger Blaue, Irish Cobbler, Rural, Kerr's Pink, Preussen, Eersteling [Duke of York], Jubel, Juli, and Arran Comrade. *D. stramonium* developed symptoms similar to those described above on inoculation with the juice of these varieties. The symptoms produced on President potatoes sometimes left a doubt as to whether the virus concerned was that of acronecrosis or acropetal necrosis [ibid., x, p. 746], but in such cases inoculations on *D. stramonium* gave conclusive indications.

GIGANTE (R.). **Risultati di un' esperienza sull'ereditarietà della maculatura interna dei tuberi di Patata.** [Results of an experiment on the hereditary nature of internal spotting of Potato tubers.]—*Boll. R. Staz. Pat. Veg.*, N.S., xii, 3, pp. 275–277, 2 figs., 1932.

When potato tubers showing an internal, irregular, reddish-brown spotting resembling the hereditary type of 'Eisenfleckigkeit' [*R.A.M.*, ix, p. 199; xi, p. 199] were planted, the resultant plants appeared normal but the tubers showed the same condition. The yield from the originally affected tubers was only one quarter to one half that of the healthy controls, and 20 to 70 per cent. of the tubers from each plant were affected. The condition is considered to be a virus disease due to the pseudo-net necrosis virus of Quanjer, transmitted by *Myzus persicae* [*R.A.M.*, ix, p. 483; x, p. 746].

EGLĪTS (M.). **Der Einfluss der Infektion auf die Temperatur und die Kohlensäureabgabe bei Kartoffeln.** [The influence of infection on temperature and the emission of carbonic acid in Potatoes.]—*Phytopath. Zeitschr.*, v, 4, pp. 343–379, 18 diags., 15 graphs, 1932.

Full details are given of an apparatus for the measurement of temperature variations and of the production of carbonic acid in

potato tubers infected by blackleg (*Bacillus phytophthorus*). The temperature variations are electrometrically determined and the production of carbonic acid measured by titration. The experiments were carried out on whole and bisected tubers of the Kaiserkrone and Fischli varieties.

Infection by *B. phytophthorus* was found to cause appreciable rises in temperature, accompanied by an enhanced production of carbonic acid, extending through all the tissues of the diseased tuber, though most marked at the site of invasion. Both the rise in temperature and the increased production of carbonic acid in diseased plants reached a climax after varying periods, succeeded by a decline affecting all the tissues. The maximum temperature was attained in whole tubers in 50 to 75 hours, the corresponding period for bisected ones being 55 to 100. Carbonic acid production reached a maximum after 60 to 160 hours in different tests, the increase over the normal for healthy tubers ranging from 467 to 1,063 per cent.

Although no conclusive results can be drawn from these experiments, it would seem that the phenomena under discussion are connected with the secretion by the parasite of metabolic products or toxins, the action of which on the host tissue is analogous to that of narcotics [cf. *R.A.M.*, xii, p. 45]. The small quantities of these substances released in the early stages of infection stimulate the production of carbonic acid, a process that is subsequently arrested by the increasing amounts of toxins liberated with progressive invasion of the tissues.

MAGEE (C. J.). **The occurrence of blackleg of Potatoes in New South Wales.**—*Agric. Gaz. New South Wales*, xliii, 12, p. 886, 1932.

The author states that in 1932 he definitely established the occurrence of potato blackleg [*R.A.M.*, xi, p. 258] in New South Wales, where in the spring the disease occasioned heavy losses in many potato crops in the coastal areas. It is pointed out that the author's isolations of the bacteria causing the disease [*Bacillus phytophthorus*] did not agree in cultural characters with an organism isolated by Waterhouse in 1931 from a suspected blackleg plant, but it is thought possible that the latter may come within the group recorded in other parts of the world as blackleg pathogens [loc. cit.].

SIBILIA (C.). **Esperienze di lotta contro la scabbia delle Patate.** [Experiments in the control of Potato scab.]—*Boll. R. Staz. Pat. Veg.*, N.S., xii, 3, pp. 298-305, 1932.

In field tests near Naples, using the highly susceptible Böhm's Allerfrüheste Gelbe variety showing 100 per cent. scab (*Actinomyces scabies*) [*R.A.M.*, xi, p. 533; xii, p. 189], 26 per cent. of the tubers in the control plot (given only the usual fertilizer) became scabby. In the plot given stable manure 27·5 per cent. of the tubers were scabbed. When the seed pieces were disinfected with sulphur there were 14·5 per cent. infected tubers, this figure falling to 9·5 per cent. when Caffaro powder [ibid., i, p. 66 *et passim*] was used. When slaked lime was added to the soil at the rate of 10

quintals per hect., the tubers themselves being untreated, only 11 per cent. infection resulted, the addition of gypsum and sulphur giving, respectively, 19 and 21 per cent. infection. The corresponding figures for parallel plots in another locality were 18, 30, 16, 10, 7, 14, and 18 per cent. Pointing out that the beneficial effect of the slaked lime confirms the result recently obtained by Schlumberger with quicklime [ibid., xi, p. 321], the author states that in one of the localities where scab is prevalent the soil contained only 1 per cent. calcium carbonate though its P_H value was 8·3.

When a grower planted (on soil not previously sown to potatoes for four years) a plot of the same variety, all seriously scabbed, about 18 per cent. infection resulted. In another test some control was given by dusting the seed pieces with a proprietary powder with a mercury base 'unidea'.

A very prevalent condition, consisting in an abundant development of corky flakes on the tubers, generally attributed to the nature of the soil or drought, was noted during a wet season in one locality where the soil is very light and copious irrigation is practised; the author considers that it is definitely a disease, probably of the virus group.

MOREAU (F. v.). **Schorf und Stippigkeit bei Kartoffeln.** [Scab and internal rust spot of Potatoes.]—*Deutsche Landw. Presse*, lix, 50, p. 630, 1932.

So far the sole reliable means of combating potato scab [*Actinomyces scabies*: see preceding abstract] in Germany appears to be the cultivation of resistant varieties, such as Hindenburg, Jubel, and Ackersegen.

As regards [non-hereditary] internal rust spot ('Eisenfleckigkeit') [*R.A.M.*, xii, p. 289], the disease may occur equally on heavy, impermeable and excessively light soils with a tendency to incrustation, the fundamental cause in both cases being a disturbance of respiration.

RANG. **Schorf und Stippigkeit bei Kartoffeln.** [Scab and internal rust spot of Potatoes.]—*Deutsche Landw. Presse*, lix, 52, p. 653, 1932.

Commenting on v. Moreau's explanation of the causation of 'Eisenfleckigkeit' (internal rust spot) of potatoes [see preceding abstract], the writer adheres to his opinion that the primary factor in its development is the use of fresh pig manure. Under Oldenburg conditions it has been found inadvisable to employ the latter except as an admixture in other kinds of manure. No doubt disturbances of growth due to excessive rain and consequent stagnation in impermeable soils also play an important part in the occurrence of internal rust spot.

STRAŇÁK (F.). **Přehled odrůd Bramborů, které podle tříletých zkoušek ve Šluknově v letech 1921–32 zjištěny imunními vůči rakovině bramborů.** [List of Potato varieties which were ascertained to be immune from Potato wart disease in the three years' tests made at Šluknov from 1921 to 1932.]—*Ochrana Rostlin*, xii, 5–6, pp. 97–100, 1932.

This is a list of 50 [named] varieties of potato which showed

complete resistance to the potato wart disease (*Synchytrium endobioticum*) in the three years' field tests which have been conducted at Šluknov (Czecho-Slovakia) from 1921 to 1932 [cf. *R.A.M.*, x, p. 125]. It is pointed out that in these tests special attention was paid to yellow-fleshed, comestible varieties, most suited for cultivation by small-holders in industrial areas.

Říha (J.). **O volbě vhodných imunních odrůd Bramborů v uzavřených oblastech.** [On the choice of immune Potato varieties in quarantined areas.]—*Ochrana Rostlin*, xii, 5–6, pp. 134–138, 1932.

In this paper an annotated list is given of a number of potato varieties (chiefly for table consumption) immune from potato wart disease [*Synchytrium endobioticum*: see preceding abstract] which are recommended for cultivation in quarantined areas (within a radius of 15 km. from an infected centre) in Czecho-Slovakia. Among other information the notes also include indications of the suitability of the varieties for different types of soil and other ecological factors.

Dix & Kühlmorgen. **Untersuchungen über die Keimung der Dauersporangien von 'Synchytrium endobioticum'.** [Investigations on the germination of the resting sporangia of *Synchytrium endobioticum*.]—*Pflanzenbau, Pflanzenschutz u. Pflanzenzucht*, ix, 6, pp. 209–216, 1932.

Experiments were carried out at the Agricultural Institute of Kiel University to determine the best method of germinating the sporangia of *Synchytrium endobioticum*, the agent of potato wart disease [*R.A.M.*, xi, p. 321 *et passim*]. The sporangia used in the tests were taken direct from infected potatoes. The most satisfactory results in preliminary trials were obtained by the use of boiled expressed potato juice (100 gm. tuber to 1,000 c.c. water) + 0·01 per cent. solanin, which gave 18 per cent. germination after two days and 58 per cent. after three months, as against 3 and 30 per cent., respectively, in tap water and 13 and 46 in boiled expressed juice alone. No very marked differences were observed between the effects on sporangial germination of the extracts of a resistant (Preussen) as compared with a susceptible ('5/6') variety. The highest percentage of germination after four months in this series (82) was obtained in a 6 per cent. solution of expressed leaf juice of the resistant variety.

It was shown that the addition of certain supplementary substances (solanin, diastase, and malic acid) to the water cultures curtailed the germination period of the sporangia to some extent, but only in the case of such individuals as would normally reach maturity in four to five months. There is always a certain proportion of sporangia (some 5 per cent. a month in these tests) ready to germinate under appropriate conditions, so that in about two years all would presumably have germinated. The supplementary substances only accelerate the initial processes of germination, after which their effect completely ceases, and it appears probable from the foregoing experiments that in six months' time all the cultures would show similar germination percentages.

[Nattrass (R. M.).] **The wilt disease of Potatoes.**—*Cyprus Agric. Journ.*, xxvii, 4, pp. 138–139, 1932.

In 1932 the wilt disease of potatoes associated with *Fusarium* and *Rhizoctonia* spp. developed comparatively late in Cyprus, in contrast to 1931 when it caused heavy and widespread damage during August, September, and early October [*R.A.M.*, xi, p. 695]. Apparently healthy plants suddenly droop as though severed from the base and rapidly die. The haulms are usually darkened near the collar, at which point the stem later decays, while a brown discoloration of the xylem extends for some distance up the stem. Both the fungi involved inhabit the soil and probably enter the stems through epidermal cracks due to over-watering. Infection may pass from the haulm to the tubers which, if planted, will produce a diseased crop. Control measures are briefly indicated.

Beeley (F.). **Effect of meteorological factors on the virulence of Oidium heveae in Malaya.**—*Journ. Rubber Res. Inst. Malaya*, iv, 2, pp. 104–114, 4 graphs, 1932.

Though *Oidium heveae* is prevalent in Malaya [*R.A.M.*, xi, p. 744], no real epidemic of leaf fall of rubber due to it has yet occurred. Some districts have suffered moderately, but control measures have not been required and the trees have shown no reduction in yield or vigour. In Ceylon, Java, and Sumatra the areas severely attacked are all at altitudes over 1,000 ft., but in Malaya no rubber is grown at altitudes over 400 ft.

In a cold chamber with a temperature varying between 56° and 62° F. and relative humidity (the vapour pressure represented as a percentage of the maximum possible at the given temperature) between 75 and 80·6 per cent., the fungus made excellent growth on the host, spreading rapidly over rubber leaves and flowers and producing chains of 3 to 7 spores. At room temperature, 72° to 92°, with humidity varying between 50 and 93 per cent., medium growth took place, with the production of chains of 2 or 3 spores. At temperatures between 45° and 50° (humidity between 73·6 and 78 per cent.) the mycelium at first spread well over the leaf surfaces, but very few conidiophores were produced and each bore only one spore. For optimum growth, spore production, and spore germination *O. heveae* requires a temperature between 56° and 62°, a relative humidity between 75 and 80 per cent., and suitable living tissue on which to grow. The fungus grew best on fresh young rubber leaves two or three inches long.

In the Malay States the temperature is always above the maximum limit for the optimum growth of the fungus, while the humidity favours its optimum activity for only about one hour in the morning and less than two hours in the afternoon.

Beeley (F.). **Report on sulphur dusting experiments.**—*Journ. Rubber Res. Inst. Malaya*, iv, 2, pp. 115–122, 1 pl., 1932.

Dusting tests carried out in Malaya against *Oidium heveae* (using a Björklund machine) showed that flotate sulphur [*R.A.M.*, xi, pp. 672, 802] containing over 90 per cent. pure sulphur had better physical properties than mud sulphur containing 70 per cent. pure sulphur, in that it was drier, formed a denser cloud

which remained suspended over the trees for two or three minutes, and contained less granular matter. Between the 2nd and 18th March rain fell on nine days, twice interfering with the dusting. The experiment was stopped when some 1,200 acres had been dusted. From 250 to 300 acres were easily dusted in an 8-hour day, so that working once a week one machine should dust 2,100 acres per season. The total cost per acre, for five weekly applications each of 10 lb. flotate sulphur amounted to $3·36 [= 7*s.* 10*d.*]. It appears that 7 to 10 lb. of sulphur per acre per application are necessary to maintain a prophylactic effect for ten days.

Conn (H. J.). **The Cholodny technic for the microscopic study of the soil microflora.**—*Zentralbl. für Bakt.*, Ab. 2, lxxxvii, 9–12, pp. 233–239, 4 figs., 1932.

Attention is drawn to the great value of Cholodny's technique for the microscopic study of soil micro-organisms [*R.A.M.*, xi, p. 802], an important feature of which is its capacity for indicating a change in the predominating flora from fungi to actinomycetes or bacteria and vice versa. The method consists essentially in pressing a microscope slide against the side of a narrow trench cut in the soil and leaving it in position for about two weeks so that the soil organisms grow over the adhering surface, then removing and staining for examination. The author prefers to place the soil to be examined in a tumbler and insert two slides which can be left for different periods, one being removed usually after 5 to 7 days.

Todd (Ramona L.). **Phycomycetes, Ascomycetes, and Fungi Imperfecti in Oklahoma soil.**—*Science*, N.S., lxxvi, 1977, p. 464, 1932.

Samples of soils in Cleveland County, Oklahoma, were taken at four different depths, viz., 2, 8, 20, and 40 cm. below the surface, the average numbers of fungi at each depth being 313,000, 423,000, 134,000, and 195,000 per gm., respectively [cf. *R.A.M.*, xi, p. 264]. *Aspergillus niger* was very extensively represented, constituting 43·7 per cent. of the fungi at 2 cm., 38·9 at 8, 26·6 at 20, and 25·2 at 40. Possibly the strictly aerobic character of this organism may account for its decline at the lower depths.

Jensen (H. L.). **Contributions to our knowledge of the Actinomycetales. IV. The identity of certain species of Mycobacterium and Proactinomyces.**—*Proc. Linn. Soc. New South Wales*, lvii, 5–6, pp. 364–376, 4 figs., 1932.

In the fourth paper of this series [*R.A.M.*, xii, p. 241] the author deals with seven organisms previously described as species of *Mycobacterium* but which, on account of their mycelial growth in the initial stages of their life-cycles, were found to belong to his recently established genus *Proactinomyces* [ibid., xi, p. 602]. One of these, *P. corallinus*, was isolated from Australian soils, the others being obtained from Europe for comparison. The species of this genus so far examined form two groups, the first of which includes non-proteolytic and partially acid-fast, and the second

mostly proteolytic and non-acid-fast organisms. From the latter group there is a clearly marked transition to *Actinomyces*.

Jones (W.). **The downy mildew of the Hop in British Columbia.** —*Journ. Inst. of Brewing*, N.S., xxx, 3, pp. 126–127, 1933.

Experiments conducted at Saanichton, British Columbia, indicated that the infection of hop seedlings by downy mildew [*Pseudoperonospora humuli*: *R.A.M.*, xi, p. 602] occurs at or below soil level, the fungus first attacking the cotyledons and then becoming systemic in the plant. Initial infection is probably caused from oospores which occur abundantly in the bracts of diseased cones, though there is a possibility that it comes from hibernating mycelium within the seed. Seedling infection is of practical importance to growers, since cultivation is frequently neglected in the early spring owing to the heavy rainfall, with the result that diseased seedlings come up and produce large crops of conidia under particularly favourable conditions.

Satisfactory results have been obtained in preliminary experiments in the Fraser Valley by dusting the young crown shoots in the spring with Bordeaux dust (16 lb. copper sulphate to 100 lb. calcium hydroxide), infection in one garden being reduced from 31 per cent. in the untreated part to 4·6 and 0·3 per cent., respectively, in two dusted sections. The development of basal spikes was adequately held in check by this means. The cost of dusting the crowns is negligible in comparison with spraying. The mixture was applied at the rate of 50 lb. per acre, and one person was able to dust 8 acres a day. The approximate cost of materials and treatment was $ 1·25 per acre.

Control of Hop downy mildew by dusting.—*Brewers' Journ.*, lxix, 811, p. 51, 1933.

On the whole, the results of experiments in Canada and the United States in the control of hop downy mildew [*Pseudoperonospora humuli*: see preceding abstract] by dusting with copper sulphate and lime between 1928 and 1931 were sufficiently encouraging to justify further trials, which were conducted in 1932 by G. R. Hoerner of the United States Department of Agriculture.

Copodust, a proprietary material consisting of 1 part monohydrated copper sulphate and 4 of lime [*R.A.M.*, ix, pp. 266, 358] was applied in excess during the early morning. For the first application hand dusters were used, while the second and third treatments were applied with a power duster.

By 24th May, when stringing was completed, infection was general. The first dust was applied on the 25th, and an examination between 9th and 14th June showed heavy infection, both in the dusted and the control plots, though the former showed a higher proportion of healthy plants. The second application was begun on 30th June and completed on 12th July, and here again there was no striking difference as regards downy mildew between the treated and untreated plots. No recent infection was apparent and very few spikes were in evidence. Slight burning of the

leaves and flowers by the copper was apparent. The final dustings were made on 9th and 12th August, an excellent covering (as in the second application) being obtained, with no burning. The increased yield due to dusting, however, was insufficient to justify the expense of the treatment, which may nevertheless be a valuable adjunct to spraying, especially during wet periods late in the season when it is necessary to cover large areas in a short time.

BLATTNÝ (C.). **Poznámky o Peronospoře Chmelové (Pseudoperonospora humuli Miyb. et Tak.).** [Notes on the *Peronospora* of Hops (*Pseudoperonospora humuli* Miyabe et Tak.).]—*Ochrana Rostlin*, xii, 5–6, pp. 139–144, 1 graph, 1932. [German summary.]

A survey of the main climatological factors in Czecho-Slovakia during the three years 1930 to 1932 shows that in that country serious outbreaks of downy mildew (*Pseudoperonospora humuli*) of hops occur only in abnormally wet seasons, when there are over 59 rainy days between the beginning of May and the end of September, with intervals of not more than 5 or 6 dry days between the wet periods. It is only during such years that the disease requires control by spraying.

Artificial inoculation experiments with summer spores on first year selfed seedlings of the variety Semšům červeňák indicated that the seedlings did not differ from the parent plants in their susceptibility to *P. humuli*. Terminal and lateral spikes were formed on the seedlings [cf. *R.A.M.*, xii, p. 111]. This demonstrates that tests of the resistance of new varieties may be successfully made on seedlings in their first year of growth, thus shortening the test trials as practised hitherto by a whole year.

RICHARDSON (P.). **Cane varieties in Puerto Rico.**—*Facts about Sugar*, xxvii, 12, pp. 530–532, 2 diags., 1 map, 1932.

Mosaic is stated to be the only sugar-cane disease of real economic importance in Porto Rico, where a record crop was produced in 1932, and its control presents virtually no difficulty, except in the west and north-west of the island where the P.O.J. 36 and 313 varieties are still grown, and in the Manati Valley and central-eastern regions in which B.H. 10 (12) and S.C. 12 (4) are largely cultivated. The infected areas are gradually diminishing owing to the extended use of P.O.J. 2725 and 2878, as well as the varieties bred by the Insular Experiment Station, which are not only immune from mosaic but excellent yielders [*R.A.M.*, xii, p. 113].

Gummosis [*Bacterium vascularum*: ibid., xi, p. 542] exists only on the island of Vieques, where there are some 4,000 acres of the susceptible Cristalina and Rayada varieties under cultivation, while pokkah-boeng [*Gibberella moniliformis*: ibid., xi, p. 403] is uniformly present in a mild form on P.O.J. 2725 and 2878.

A map shows the distribution of cane varieties in the different parts of Porto Rico in 1932.

DODDS (H. H.). **The origin of mosaic disease.**—*South African Sugar Journ.*, xvi, 11, pp. 617, 619, 1932.

The following information is extracted from a report prepared

by the author on the sugar industry of Porto Rico, based on observations made and data collected during his visit to the island in March, 1932, as a delegate to the International Congress of Sugar Technologists (p. 609). Mosaic originated in the North Coast hills of Porto Rico in 1915 and spread rapidly until the establishment of the Uba cane, which was found to be immune in 1918 and distributed for general cultivation in 1924. In that year the yield per acre in the Pagan district amounted to 29·84 tons compared with 16·24 in 1917 (before mosaic) and 12·40 in 1921, when the disease was severe. In San German the yields in 1917, 1922, and 1924 were 17·78, 10·08, and 24·51 tons per acre, respectively, while in Eureka the production rose from 8 tons per acre in 1921 to 20·22 in 1924. The disease is no longer regarded as a serious factor in the Porto Rican sugar-cane industry, owing to the extensive cultivation of superior resistant varieties, e.g., P.O.J. 2725 and 2728, and new seedlings [see preceding abstract].

KOPP (A.) & D'EMMEREZ DE CHARMOY (D.). **Situation actuelle de la mosaïque de la Canne à la Réunion.** [The present Sugar-Cane mosaic situation in Réunion.]—*Stat. Agron. Réunion, Travaux Techniques*, Bull. 3, pp. 11–19, 1932.

Mosaic of sugar-cane is now prevalent throughout all the leeward region of Réunion [see next abstract]. There are three main centres of infection, near one of which, however, only slight attacks are experienced owing to the large-scale planting of the completely immune variety Richfund No. 1, a first generation hybrid of a cross between true Uba and D. 109. No correlation was established between intensity of attack or varietal susceptibility and the altitude of the plantation. Louzier, Port Mackay, Mapon, and M. 131 are classed as highly susceptible, Batavia (Guinghan), D. 74, Isautier, and M. 55 as showing average infection, Big White Tanna and Naz as showing relatively slight infection, P.O.J. 213 and 36 as very slightly affected (relatively tolerant), and Uba, Uba Seedling blanche, Uba Marat, Richfund No. 1, and Uba No. 4 as completely resistant. The P.O.J. canes 2878, 2725, 2714 and the Co. canes 214, 290, and 281 have not yet shown mosaic. In the badly affected areas the only possibility of control consists in complete replacement of the diseased varieties.

KOPP (A.) & D'EMMEREZ DE CHARMOY (D.). **Observations nouvelles concernant la mosaïque de la Canne à Sucre et le streak du Maïs.** [New observations of mosaic of Sugar-Cane and streak of Maize.]—*Stat. Agron. Réunion, Travaux Techniques, Bull.* 3, pp. 1–10, 3 figs. [facing p. 12], 1932.

In the leeward part of Réunion where mosaic of sugar-cane is present [*R.A.M.*, x, p. 490] all the Noble varieties are affected, Louzier and Port Mackay have almost disappeared under the combined attack of mosaic and gummosis [*Bacterium vascularum*], and M. 131 (Black Innis) and Batavia (Guinghan) are violently attacked and become progressively less resistant every year. The windward side of the island is relatively free from the disease except in one locality.

A similar instance of prolonged incubation to that already

reported [ibid., x, p. 490] occurred on a P.O.J. 2725 × Uba Marot seedling. In January and February, 1931, i.e., seventeen months after the last of the previously reported infections, all the canes grown in the Agricultural Station collection as original stock were cut down and removed to another locality, the stumps being left; in December, 1931, the original stool of Guinghan × D. 74 and three others of the same parentage became affected. This, it is considered, implied an exceptionally long incubation period, latency, or reinfection from an apparently healthy cane. In the locality to which the canes were removed, ten months after planting and seventeen months after the last case of mosaic had been seen in the original locality, a stool of A. 12/29 seedling and one of A. 166/29 (both from Guinghan × D. 74) suddenly showed mosaic, although no previous outbreak had been known in the district.

Streak disease of maize [ibid., ix, pp. 300, 767] is very severe in most plantations in Réunion, but though the sugar-cane variety R.P. 8 is affected almost throughout the island, it is practically the only cane that does show streak, even when other cane varieties usually considered to be susceptible are growing near it. Streak was experimentally transmitted by means of *Aphis maydis* from *Coix lacryma-jobi* (on which it is very common in Réunion) to R.P. 8 canes. It is carried from maize to maize by this insect, but not from maize to sugar-cane or from one variety of cane to another. In one locality where streak disease is very severe on maize, the diseased plants were covered with aphids, but heavily infected stools of maize placed near a cane variety generally regarded as susceptible did not spread infection, while oats very near affected maize did not contract the disease. Probably there are many different sources of the streak virus, each of which is accessible to only one species of insect. The authors suggest that 'carrier' hosts may exist which show no symptoms of the disease, but can serve as a source of inoculum.

Kopp (A.) & D'Emmerez de Charmoy (D.). **Trois maladies de la Canne nouvelles pour la Réunion.** [Three diseases of Sugar-Cane new to Réunion.]—*Stat. Agron. Réunion, Travaux Techniques, Bull.* 3, pp. 21–26, 1 map, 9 figs. [preceding p. 13], 1932.

After describing the symptoms of pokkah-boeng [*Gibberella moniliformis*] and twisted top of sugar-cane [*R.A.M.*, xi, p. 403], the authors state that the latter was exceedingly prevalent in Réunion in 1931, probably as a result of a cyclone followed by drought; in 1932 its incidence greatly diminished. Many serious cases of pokkah-boeng were noted in two localities on D. 74, and P.O.J. 2878 and 2714.

In 1931 and 1932 stem galls, which sometimes caused symptoms resembling witches' broom and sometimes merely a neoplastic growth with the structure of a rudimentary leaf [ibid., xi, p. 604], were noted on several sugar-cane varieties, especially R.P. 73 and P.O.J. 2878. On the latter, on which the condition was much the most marked, it always appeared during rainy weather on young suckers, seldom above the third or fourth internode. On R.P. 73 the neoplasm generally developed near the leaf scars along the

whole length of the cane, in any season and at any age. The excrescences never attained the size of those on P.O.J. 2878 and had a cauliflower-like appearance.

Bell (A. F.). **Banded (sectional) chlorosis associated with tangle top and death of Sugar-Cane.**—*Queensland Agric. Journ.*, xxxviii, 6, pp. 476–483, 6 figs., 1932.

This is a brief account of the sugar-cane trouble which was described from Cuba by Faris under the name 'cold chlorosis' [*R.A.M.*, vi, p. 184], but as the condition has since been observed in greenhouses, later authors have reverted to the original name of sectional chlorosis [ibid., ix, p. 203], and in 1929 Martin suggested the name banded chlorosis as more descriptive of the condition. It is stated to be extremely common throughout the winter months in New South Wales and central and southern Queensland in localities where the varieties M. 1900 Seedling and D. 1135 are grown extensively. In the northern section of the Queensland sugar-cane belt it is seen rather infrequently on Badila (which forms over 90 per cent. of the crop). While in susceptible varieties the injury caused by banded chlorosis may be such as ultimately to kill the plant, in resistant varieties it is limited to the inhibition of the development of chlorophyll in the affected areas, frequently resulting in a reduction by more than 50 per cent. of the effective leaf surface; as this reduction, however, occurs mainly during the dry, cold months of the year, when growth is practically at a standstill, it is not believed that the trouble causes any appreciable loss in tonnage.

Hammarlund (C.). **Beiträge zur Kenntnis der Mikromycetenflora der Provinz Skåne (Schonen).** [Contributions to the knowledge of the micromycete flora of the province of Schonen.]—*Arkiv för Bot.* xxv A, 2, No. 3, pp. 1–126, 3 pl., 1933.

The following records among this list of fungi (approaching a total of 2,000) of Schonen, the southernmost province of Sweden, are of special interest. *Olpidium pisi* n. sp. was found in the roots and hypocotyls of peas grown from seeds from France at the Landskrona Seed Testing Laboratory. The fungus is characterized by smooth, globular sporangia, 18 to 28 μ in diameter, usually occurring singly, rarely in groups of 2 to 4 in the epidermal cells, or occasionally in those of the parenchyma, the neck projecting up to 10 μ; oval zoospores 4 by 2 μ, each with one cilium up to 8 μ in length; and globular, smooth, thick-walled, resting spores with pale yellow contents, 14 to 20 μ, germinating by zoospores, 4 by 2 μ, each with a cilium up to 14 μ long.

Viola tricolor plants were attacked by a *Peronospora* apparently identical with *P. violae*, though the conidia were somewhat larger than those of the type species on *V. arvensis* (17·4 to 33 by 14·8 to 26·6 μ, average $26{\cdot}6 \pm 0{\cdot}4$ μ by $19{\cdot}8 \pm 0{\cdot}2$ μ, compared with 25 by 18 μ). Possibly the species on *V. tricolor* (apparently a new host) may be a biologic form of *P. violae*, or it may be merely a question of a matrical modification affecting the fungus on a cultivated plant.

A celery seedling was severely infected by a species of *Pythium*, presumably *P. de Baryanum* though differing from the latter in several important respects. The profusely branching mycelium forms a thin, web-like coating over the surface of the plant and develops both inter- and intracellularly in the host tissues. The superficial branches often bear swellings of varying size (a few up to 40 to 47 μ in diameter) at their apices, possibly representing rudimentary sporangia, while a few intercalary, fusiform swellings may be undeveloped conidia. Celery leaves were also infected by *Protomyces inundatus*.

Bean (*Phaseolus vulgaris*) leaves and pods were attacked by *Ascochyta phaseolorum* [*R.A.M.*, vi, p. 715], of which two apparently different forms were found, one at Bunkeflo with spores measuring 10 to 12 by 3 to 4 μ and another at Landskrona (18 to 22 by 6 to 7 μ), the former dimensions agreeing fairly well with those given by Allescher (10 by 3 μ) and the latter with Lind's figures (20 to 25 by 6 to 8 μ).

The detection in 1930 of the aecidial stage of *Puccinia mirabilissima* on *Mahonia* [*Berberis*] *aquifolium* [ibid., x, p. 109 and above, p. 293] necessitates an addition to the diagnosis of the rust, which is as follows. The spermogonia, measuring 110 to 120 μ in height and 100 to 115 μ in breadth, are immersed in the palisade tissue and form a group on the upper side of the leaf on the dark red lesions. The broadly infundibuliform aecidia generally occur in groups on the under side. The pseudoperidial cells are distinctly polyhedral and arranged in rows, their inner walls 2 to 3 μ in thickness, and the outer ones 10 to 16 μ prolonged to a long point almost covering the adjacent cell. The rounded to oval or slightly polyhedral aecidiospores measure 16·2 to 22·6 by 14·8 to 21 μ (average of 200, $20{\cdot}2 \pm 0{\cdot}1$ by $16{\cdot}0 \pm 0{\cdot}03$ μ), and have an evenly thickened wall about 1 μ in thickness all round.

UNAMUNO (L. M.). **Algunos micromicetos nuevos o poco conocidos de la flora española.** [Some new or little known micromycetes of the Spanish flora.]—*Bol. Soc. Española Hist. Nat.*, xxxii, 9, pp. 439–449, 1 fig., 1932.

Continuing his critical studies on the fungi collected in various parts of Spain, the writer here enumerates 32 species from the northern, central, and southern regions of the Peninsula [cf. *R.A.M.*, xi, p. 604]. The list includes 10 Sphaeropsidaceae and 15 Uredinales. *Phyllosticta mali* [*R.A.M.*, x, p. 296] was found producing round or elongated, pale to bleached spots, up to 10 mm. in diameter, on the upper side of apple leaves, which were seriously damaged by the fungus. *P. phaseolorum* forms spherical, concentric, pale to ochraceous-brown lesions, 6 to 20 mm. in diameter, with sharply defined, darker margins, on both leaf surfaces of beans (*Phaseolus vulgaris*), causing necrosis of the parenchyma. Both these records are new to Spain.

HÖHNK (W.). **A new parasitic Pythium.**—*Mycologia*, xxiv, 6, pp. 489–507, 1 pl., 5 figs., 5 graphs, 1932.

This is a detailed morphological account of a species of *Pythium*, considered to be new to science and furnished with a Latin

diagnosis, which was isolated from a soil sample taken from the surface at the waterline of a pond near Milton, Wisconsin, out of association with any visible plant growth. In pure culture, the fungus grew best on ant larvae, on which it developed within 2 or 3 days a mycelial weft 1 to 1·5 cm. in diameter, the main branches of which were about 6 μ in diameter. The zoosporangia are intercalary, rarely terminal, globose (21 to 34 μ) or ovate (22 to 29 by 19 to 24 μ), evacuating through a long tube. Most, however, become resting sporangia, also eventually evacuating as the former, or, on growing older, germinating by means of a germ-tube. Towards the end of the growth, gemmae of various shapes were also formed. Sexual organs appeared at the end of 36 hours in culture. Most of the oogonia were intercalary, 19 to 29 μ in diameter, and supplied each with an epi- and hypogynous antheridium, up to 18 μ long, both of which evacuated into the oogonium. The oospores, not completely filling the oogonia, were 14 to 22 μ (mostly 18 μ) in diameter and with a wall 1·5 μ thick.

The fungus, which is named *P. epigynum* n. sp., was shown in the laboratory to be pathogenic to seedlings raised from pea, bean, grass, and maize seeds grown in sterilized soil.

MATSUMOTO (T.), YAMAMOTO (W.), & HIRANE (S.). **Physiology and parasitism of the fungi generally referred to as Hypochnus sasakii Shirai. I. Differentiation of the strains by means of hyphal fusion and culture in differential media.**—*Journ. Soc. Trop. Agric.*, Formosa, iv, pp. 370–388, 4 figs., 1932.

A full account is given of the writers' investigations on the physiology and parasitism of the group of fungi usually known as *Hypochnus* [*Corticium*] *sasakii* [*R.A.M.*, xi, p. 801], 17 strains of which were collected in Formosa on various hosts, including rice, sugar-cane, groundnut, French bean (*Phaseolus vulgaris*), cowpea, and camphor (*Cinnamomum camphora*). Two other strains (18 and 19) used in the studies were received as *Rhizoctonia* [*Corticium*] *solani* and isolated, respectively, from cotton seedlings in India [ibid., x. p. 661] and from 'scurf' of potato tubers in Germany.

All the first-mentioned 17 strains were determined as *C. sasakii*, although No. 17 from camphor was somewhat aberrant. Tests of the affinity of the organisms were carried out by the method of hyphal fusion in mixed cultures [cf. ibid., xi, p. 458], from which it was ascertained that Nos. 1 to 16 all fuse with one another and with strain 18 from cotton in India, while 17 only fused imperfectly with all the other strains except 19 (*C. solani* from potato), the last-named making no union with any of the other forms. It is concluded, therefore, that Nos. 1 to 16 and 18 are all more or less nearly related and determinable as *C. sasakii*, No. 17 more distantly allied, but referable to the same species, and No. 19 quite distinct (*C. solani*).

CHOW (C. H.). **Septobasidium lanatum, nov. spec.**—*Ann. de Cryptog. Exot.*, v, 2, pp. 68–69, 2 pl. (1 col.), 1932.

Latin and French diagnoses are given of *Septobasidium lanatum* n. sp., collected on a tea branch in Cochin-China in 1931. The fungus is characterized by a homogeneous trama consisting of

loosely woven, branched, septate, hyaline to brown hyphae, 5 to 6 μ in diameter; brown conidia, usually moniliform but occasionally glomerulate, 5 to 7 μ in diameter; and hyaline, pedicellate, thin-walled, spherical cells, up to 20 μ in diameter, bearing basidia in various stages of development and apparently representing probasidia. The extremity of the pedicel penetrates the probasidium like a columella. These cells are similar to those found by Boedijn and Steinmann in *S. tuberculatum* in the Dutch East Indies [ibid., ix, p. 562]. Granular nodules up to 1 mm. in diameter are scattered in the thallus and invariably contain coccids.

Christensen (C.). **Cultural races and the production of variants in Pestalozzia funerea.**—*Bull. Torrey Bot. Club*, lix, 9, pp. 525–544, 6 figs., 1932.

This is an expanded account of the writer's studies in Minnesota on the development of physiologic strains and *Monochaetia*-like variants in monospore cultures of *Pestalozzia funerea* isolated from long-leaf pine (*Pinus palustris*) leaves attacked by *Septoria acicola* [*R.A.M.*, xi, pp. 413, 813].

Smee (C.) & Leach (R.). **Mosquito bug the cause of stem canker of Tea.**—*Nyasaland Dept. of Agric. Bull.* 5 (N.S.), 7 pp., 3 pl., 1932.

The tea canker prevalent in Nyasaland [*R.A.M.*, xii, p. 9] has been found to be due to the mosquito bug (*Helopeltis bergrothi*) and not to a fungus as was previously believed [ibid., x, p. 707]. A description is given of the canker and its causation by the insect, control measures also being indicated.

Vinson (C. G.). **Mosaic diseases of Tobacco: V. Decomposition of the safranin-virus precipitate.**—*Phytopath.*, xxii, 12, pp. 965–975, 1932.

A fully detailed and tabulated account is given of the writer's experiments on the decomposition of the safranin-tobacco mosaic virus precipitate by Lloyd's alkaloidal reagent, a brief note on which has already appeared [*R.A.M.*, xi, p. 407].

Jochems (S. C. J.). **Toprot en rotstelen bij Deli-Tabak (Bac. aroideae Townsend.)** [Top rot and hollow stalk in Deli Tobacco (*Bac. aroideae* Townsend).]—*Meded. Deli Proefstat. te Medan-Sumatra*, Ser. II, lxxix, 40 pp., 6 figs., 1932. [English summary.]

Bacillus aroideae was isolated from Sumatran tobacco plants affected by top rot and 'hollow stalk' and shown by inoculation experiments to be responsible for both conditions [*R.A.M.*, xi, p. 478]. The disease develops as a soft rot of the medulla of full-grown plants, causing the top leaves to wilt and the upper part of the stem to become hollow. In some cases the lower parts of the stem are similarly affected and the lower leaves collapse. The same organism was further shown to cause 'stem rot' in the drying shed. This is a wet decay of the midrib and large veins of green tobacco leaves, which commences immediately they have been hung up for curing. It is the most serious rot of tobacco in

the drying sheds. In severe cases the veins are so weakened that many leaves drop from the strings. Probably stem rot is introduced into the drying sheds by leaves picked from plants with hollow stalk. Cross-inoculations proved that the organism isolated from each disease was able to cause the symptoms of the other. It was also ascertained by experiments that stem rot is spread by the use of infected stringing needles and strings. The extension of hollow stalk may be arrested by refraining from topping the infected plants under conditions favouring the disease, while the incidence of stem rot may be reduced by thorough ventilation of the drying sheds and strict precautions against the use of leaves from hollow stalk plants.

Under very damp conditions wilt (*Bacterium solanacearum*) [ibid., xi, p. 477] may assume quite an atypical form characterized by a rotting of the pith of the stem that ultimately leads to the breaking off of the top. As a rule there are no external symptoms of necrosis. The midribs of diseased leaves may be slightly rotted at the junction of the leaf with the stem, but the foliage thus affected usually cures quite normally in the drying sheds.

MEURS (A.). **Proeven omtrent spikkelbestrijding, genomen in de jaren 1931 en 1932.** [Experiments in leaf spot control made in the years 1931 and 1932.]—*Meded. Deli Proefstat. te Medan-Sumatra*, Ser. II, lxxx, 21 pp., 1932. [English summary.]

Neither seed disinfection with various standard fungicides nor treatment of the soil of the seed-beds with 2 per cent. formalin proved effective against leaf spot (frog eye) of tobacco (*Cercospora nicotianae*) in Sumatra during 1931–2 [*R.A.M.*, xi, p. 477]. The occurrence of spots on the seedlings, however, was largely prevented by spraying them with Bordeaux mixture. The effect of spraying the field crop with Bordeaux mixture was confined to the leaves actually sprayed and did not extend to the rest of the plant. No deposit of Bordeaux mixture was left on the leaves at the time of fermenting when the rains were abundant, but in the absence of rain a brownish- or greenish-black, colloidal copper-containing residue remained on leaves sprayed more than 20 days after transplanting and completely spoiled them for wrapper purposes. The TL 13 strain of Deli tobacco was found to be slightly more susceptible to *C. nicotianae* than the others in common use, of which 8 is specially resistant.

JONES (L. K.). **The sources of the viruses that cause streak of Tomato.**—Abs. in *Phytopath.*, xxii, 12, pp. 999, 1932.

Tomato streak, as it occurs in Washington greenhouses, is stated to be caused by a combination of the latent potato and the common tobacco mosaic virus [cf. *R.A.M.*, xi, pp. 271, 808]. Once the disease appears on the plants it spreads very rapidly by pruning and cultural practices. The tobacco mosaic virus seems to be introduced into the greenhouses chiefly by the use of tobacco by workmen, though it may sometimes be transmitted to tomatoes from petunias, *Solanum nigrum*, or other hosts.

DAY (W. R.). **The ink disease in England.**—*Forestry*, vi, 2, p. 182, 1932.

The author states that *Phytophthora cambivora* [*R.A.M.*, xi, p. 485] has been found since 1930 in a virulent form attacking chestnut trees in Hampshire and Herefordshire, and beeches in Somersetshire. There is no evidence to show how long the disease has been present in England, nor whether the fungus is indigenous, but in one locality at least it is known to have occurred for some time previous to its identification. The present virulent form, however, has appeared only recently, probably under the influence of certain particular conditions of the soil. Both the chestnut and the beech strain of *P. cambivora* have been shown to be parasitic on each of these hosts, but so far the beech has proved to be more resistant to both than the chestnut.

PEACE (T. R.). **The Dutch Elm disease.**—*Forestry*, vi, 2, pp. 125–142, 1 map, 1932.

The chief point of interest of this paper is a brief historical outline of the spread in England of the Dutch elm disease (*Graphium* [*Ceratostomella*] *ulmi*) [*R.A.M.*, xii, p. 126] up to 1931, and a discussion of its marked decline in severity in 1932. Mention is also made of cases of recovery of the tree, the first of which were observed in 1929; until 1932 their number was small in comparison with that of new cases, and they tended to be more frequent where the disease was only slight, but in 1932 they greatly outweighed the number of new cases and occurred frequently even in the worst diseased areas. The recoveries studied were either complete, all traces of discoloration disappearing in the wood, or incomplete, the markings still being present in the wood. In the latter case, there was a suggestion that the fungus was slowly dying out.

Examination of a number of large elms in Cambridge, which were first thought to have the Dutch elm disease, showed that they were attacked by a species of *Verticillium* [(?) *V. albo-atrum*: ibid., xii, p. 125]. No other case, however, was found among over a hundred elms examined elsewhere, and it appears unlikely that this disease is at all common in England.

CECCONI (G.). **La moria degli Olmi.** [Die-back of Elms.]—*Rivista Agricola*, xxviii, 650, pp. 478–480, 1932.

After stating that die-back of elms (*Graphium* [*Ceratostomella*] *ulmi*) has been present in Italy for about three years [*R.A.M.*, xii, p. 200] and describing an experiment in which a large number of affected elms treated by him in June, 1931, rapidly recovered and were still healthy in October, 1932, the author lays down the following recommendations for control.

A careful watch should be kept, especially towards early summer, for the first symptoms. Directly these appear, the affected branches should be cut away and burnt. The wound surfaces, branches, and trunk down as far as the top of the main roots (which should be laid bare) should then be disinfected with a mixture consisting of 100 l. water, 8 kg. iron sulphate, and 1 kg. slaked lime. The soil should at once be replaced and the ground dusted with iron

sulphate to a radius equal to the length of the branches. When dry, the wounds should be painted or tarred over. Badly diseased trees should be felled, the bark removed and burnt, the wood cut up for firewood, and the cavity dusted with quicklime, mixing it into the soil.

Legislative and administrative measures. Spain.—*Internat. Bull. of Plant Protect.*, vii, 1, p. 11, 1933.

An Order of 17th November, 1932, provides for the formation of an Institute of Agricultural Research in Spain, comprising all the experimental centres hitherto under the general management of the Ministry of Agriculture. The activities of the centres are to be extended to research work. The Institute will be divided into eight sections, headed by phytopathology.

Britton (W. E.). **Regulations concerning transportation of nursery stock in the United States and Canada.**—*Connecticut Agric. Exper. Stat. Circ.* 86, pp. 45–74, 1932.

This paper contains a very useful summary of the regulations governing the transportation of nursery stock in the United States (with the District of Columbia) and Canada, the relevant Federal quarantines being cited and the requirements of each State in respect of various plant pests and diseases set forth separately. A list of officers in charge of inspection and quarantine service in the different States is appended.

United States Department of Agriculture. Plant quarantine and control administration. Service and regulatory announcements. List of intercepted plant pests (List of pests recorded during the period July 1, 1931, to June 30, 1932, inclusive, as intercepted in, on, or with plants and plant products entering United States territory).—pp. 173–244, 1932.

Among other interceptions made by officials of the plant quarantine and control administration of the United States Department of Agriculture during the period from 1st July, 1931 to 30th June, 1932 [cf. *R.A.M.*, xi, p. 544], the following may be mentioned: *Elsinoe canavaliae* on *Phaseolus lunatus* [var.] *macrocarpus* [ibid., xi, p. 618] from Jamaica; *Entyloma ellisii* on spinach from Cuba; *Mycosphaerella schoenoprasi* on leeks from Japan; *Phoma citricarpa* [ibid., xi, p. 450] on oranges from India, China, and Japan; and *Thielaviopsis* [*Ceratostomella*] *paradoxa* on *Eleocharis tuberosa* and *Sagittaria sagittifolia* from China.

Legislative and administrative measures. Tunis (Regency of.) *Internat. Bull. of Plant Protect.*, vi, 12, pp. 208–210, 1932.

By a Decree of 11th July, 1932, the Director-General of Agriculture, Tunis, is authorized to define by Order the plant and animal parasites dangerous to crops and to which the following measures are applicable. The importation into, circulation through, and transit across Tunis of all living plants or parts thereof contaminated by any of the parasites included in the above-mentioned Order is prohibited. This regulation further extends to the

packages used for such plants and any other objects or products liable to spread infection. All other plants must be accompanied by a certificate of health and origin and submitted to sanitary inspection by the competent authorities on arrival. Property owners or occupiers are required to notify the local administrative authorities of any abnormal condition or injury to crop plants by infectious parasites on their land. Should any of the parasites included in the Order be detected on private property, the Director-General may define the limits of the infected zone and appoint the necessary measures and treatments to prevent or check the development of infection. One or more annual inspections by phytosanitary experts will be made of nursery gardens and other horticultural establishments dealing commercially in plant material for propagation.

Legislative and administrative measures. Australia (Commonwealth of).—*Internat. Bull. of Plant Protect.*, vi, 12, p. 206, 1932.

By Quarantine Proclamation No. 215 of 5th May, 1932, the importation into Australia of plants of the genus *Humulus* from any country is prohibited. The importation is authorized, however, of the flower parts commercially known as hops provided they originate in a country where neither downy mildew (*Pseudoperonospora humuli*) nor hop mosaic is known to occur.

Legislative and administrative measures. Germany (Province of Hanover).—*Internat. Bull. of Plant Protect.*, vii, 1, p. 10, 1933.

Compulsory control measures in certain districts of Hanover against the asparagus fly (*Platyparea poeciloptera*) and asparagus rust (*Puccinia asparagi*) include by Decree of 10th October, 1932, the destruction of the shoots by 1st December each year or earlier if the rust develops at an early date [*R.A.M.*, x, p. 816]. Similar regulations are in force in Anhalt (Police Ordinance of 14th July, 1932).

Legislative and administrative measures. Dominican Republic.—*Internat. Bull. of Plant Protect.*, vii, 1, pp. 12–13, 1933.

In order to prevent the introduction into the Dominican Republic of the witches' broom disease (*Marasmius perniciosus*) of cacao occurring in Ecuador, Surinam, Trinidad, and probably elsewhere, the importation of living plants or parts thereof, seeds, and pods of cacao is prohibited by Presidential Decree No. 343 of 4th February, 1932 [cf. *R.A.M.*, x, pp. 144, 624], from the countries named, while no permits will be issued by the Ministry of Agriculture and Commerce for the importation of botanical material, seeds, or pods or living cacao plants from countries other than those specified unless the disease in question is known with certainty not to occur there.